DRAFT

DEPARTMENT OF DEFENSE
HUMAN FACTORS ENGINEERING
TECHNICAL ADVISORY GROUP

MINUTES OF THE FORTY-EIGHTH MEETING
4-7 NOVEMBER 2002
ALEXANDRIA, VIRGINIA

CHAIR:

LCDR SEAN BIGGERSTAFF
PMA 205-1D
AVIATION TRAINING SYSTEMS
NAVAL AIR SYSTEMS COMMAND
PATUXENT RIVER MARYLAND

DRAFT

DEPARTMENT OF DEFENSE
HUMAN FACTORS ENGINEERING TECHNICAL ADVISORY GROUP

DoD HFE TAG-48 Minutes Editor:
Sheryl G. Cosing
10822 Crippen Vale Court
Reston, Virginia 20194
(703) 925-9791
sherylcosing@earthlink.net
DoD HFE TAG's Website: http://hfetag.dtic.mil

DoD HFE TAG CONTRACT BY:
Army Research Laboratory Aberdeen Proving Ground Site Contracts Branch
ATTN: AMSRL-OP-PR-AP
Building 434
Aberdeen Proving Ground, Maryland 21005-5001

Comments/Amendments to these Minutes should be sent to:
LCDR Sean Biggerstaff
PMA 205-1D, Aviation Training Systems
Naval Air Systems Command
547123 Buse Road
Patuxent River, MD 20670-1547
(301) 757-8135 DSN 757; FAX (301) 757-6945
biggerstaffs@navair.navy.mil

Executive Summary

The forty-eighth meeting of the Department of Defense Human Factors Engineering Technical Advisory Group (TAG) was held at the Holiday Inn Hotel and Suites, Alexandria, Virginia, 4-7 November 2002. The meeting was not hosted by any of the services. There were 101 attendees.

LCDR Sean Biggerstaff, TAG Chair, would like to express his gratitude and appreciation to all the plenary presenters, subTAG chairs, and to the TAG Program Coordinator for their contributions to the success of this meeting.

Theme

The theme of TAG-48 was Decision Support Systems. The U.S. Government has begun a series of radical transformations that will change the way in which we identify, classify, and respond to both domestic and foreign threats. These new missions, as well as the physical transformation and reorganization of the departments, will create additional demands on the intelligence gathering, data fusion, and decision-making (command and control) processes within our government.

Decision support systems (DSS) and the technologies that support these tools will play a key role in responding to the diffuse, evolving threats that face our nation. Within the DoD, changes in defense technologies and priorities will necessitate changes in the systems that support decision making at all levels. The increased operational requirement for interdepartmental and interagency information sharing, communication and joint decision making may rapidly exceed the decision support models currently in place to counter terrorism.

The challenges to the human factors professional are:

- minimize through sound design principles any adverse human performance impact presented by these new technologies/concepts,
- ensure new DSS are adaptive to the current complexity of the operator's environment and the variable needs and perspective of individual operators
- create realistic, optimized group-decision making models that can accommodate the distributed/global/multi-force decisions that the war on terror will require.

Meeting Highlights

Call to Order – LCDR Sean Biggerstaff, Aviation Training Systems, Naval Air Systems Command, Patuxent River, Maryland, called the forty-eighth meeting of the TAG to order and welcomed presenters, guest, and attendees.

Highlights –

Social – Members of the TAG attended a private guided evening tour of Mount Vernon, the home of our first president, George Washington.

Announcements

The Human Factors in Telemedicine and Biomedical Technologies subTAG and the Human Factors in Training Interest Group did not meet at TAG-48. Both groups intend to meet at TAG-49 in Augusta, GA.

Administrative Business

Minutes - TAG Minutes will now consist of a draft document posted on the website. Hard copies will only be sent to a list of VIPs that the coordinator will maintain and those individuals that request it. All other TAG members will receive an electronic notice with a link to the document. SubTAG chairs should now request "synopses" not abstracts of any presenters. Chairmen should also remind their presenters that minutes of the meeting will be posted on the website accessible to all; therefore the presenters may want to get permission before submitting a synopsis for inclusion in the minutes. If a presenter does not their synopsis submitted, the subTAG chair will list the name of the presenter and the title only.

SubTAG Reports -

Controls & Displays – Mr. Henry Williams, NAWC AD Patuxent River, will chair the subTAG effective TAG-49.

Human Factors in Telemedicine and Biomedical Technologies - This subTAG may meet in the spring only as the Army has a similar conference in Orlando every fall**.**

Human Factors Test and Evaluation – Mr. Adrian Salinas, Brooks AFB, will take over as chair at TAG-49.

System Safety/Health Hazards/Survivability – Mr. Steve Merriman, EIA, SAFE & AsMA Rep., will co-chair the subTAG for a two-year rotation along with the current chair, Mr. Ben Gibson.

Technical Society/Industry – Mr. Bill Lytle, AsMA Rep., will take over as chair for a two-year rotation.

Tri-Service Workload Coordinating – Karl VanOrden will chair the subTAG effective TAG-49.

User Feedback Interest Group – Mr. Fred Oberman will establish an interest group with respect to User Feedback. The initial meeting of the interest group will be held at TAG-49.

Personnel Selection Interest Group – LT Rick Arnold will establish an interest group to review personal selection and classification. This group will meet initially at TAG-49.

Caucus Reports –

Air Force The Air Force Service Representative, Dr. Kristen Liggett, Air Force Research Laboratory, Wright-Patterson AFB, OH), stated that while the caucus discussed some administrative items, the focus was on the challenges to the TAG set forth by Dr. Foster at TAG-47.

Army Ms. Dawn Woods, Army Representative, Natick, MA reported that the subTAG discussed the details of TAG-49 as the Army will be the meeting host. The theme for the meeting will relate to Transformation and C4ISR especially the communications piece. The subTAG spent the remainder discussing how the TAG can best respond to Dr. Foster's challenges. The caucus was reminded that at TAG-49 the Army must choose a person for the TAG's Chair Select position.

Navy - LCDR Dylan, DARPA, reported that the Navy Caucus spent most of the meeting discussing how the TAG can best the challenges set forth by Dr. Foster. The Navy's next hosted meeting will be in the Fall of '04.

FAA – Mr. Alan Poston, FAA HQ, related that the FAA would like to host a meeting in spring '04 at the FAA's Technical Center in New Jersey.

Executive Committee/Operating Board Reports –

Plenary Session planning - The hosting organization service or agency representative will provide a paragraph on the theme for the next meeting prior to the end of the current meeting. The Executive Committee is tasked with identifying speakers for the next plenary session based on the selected them. Ultimate coordination of the event still resides with the incoming TAG chair.

TAG Policies– a number of revisions have been made to the DoD HFE TAG Policies document. This along with the Operating Structure will be posted on the TAG website.

Dr. Foster's Challenges – The operating board discussed whether the DoD HFE TAG is a conference/working group or is an advisory group. As the consensus was the group is an advisory one, the followup discussion that ensued dealt with the manner or the processes by which the TAG should respond to challenges or requests from our proponent.

- Core Competency Site - The TAG will compile a list of sites/locations with a point of contact for their topic area where DoD/NASA/FAA expertise exists. The compiled list will be posted on the website.
- JWCO document - At TAG-49, LCDR Sean Biggerstaff will chair a working session of the Operating Board to make recommendations to the Warrior Readiness Joint Warfighter Capabilities and Objectives document.
- Lessons Learned – The TAG plans to develop a lessons learned case study or newsletter format to address this tasking from Dr. Foster
- C^4ISR - The C^4ISR tasking is being worked through HSIAC.

Human Factors Hot Issues - A new form for submission of these issues to the Executive Committee is available via the website. The form is self-explanatory. The TAG chair is responsible for tracking these issues and providing feedback to the members via the service representatives.

Upcoming TAG meetings - TAG-49 will be held in Augusta, GA on 12-15 May 2003. The Army's Ft. Gordon Signal Center will host. TAG-50 will be held in Tempe, AZ on 3-6 November 2003. The Air Force Research Laboratory will host. The FAA has offered to hold TAG-51 at the FAA Technical Center in the Pleasantville/Atlantic City, NJ area.

Operating Board

Proponent

Robert E. Foster, Phd
Director, BioSystems
ODUSD(S&T)/ODDR&E/OUSD(AT&L)
3080 Defense Pentagon, Rm 3E801
Washington, DC 20301-3080
(703) 588-7437 DSN 425; FAX (703) 588-7560
robert.foster@osd.mil

Program Coordinator

Ms. Sheryl Cosing
10822 Crippen Vale Ct.
Reston, VA 20194
(703) 925-9791; FAX (703) 925-9694
sherylcosing@earthlink.net

OPERATING BOARD
November 2002

Executive Committee

Current Chair (Navy)

LCDR Sean Biggerstaff
Aeromedical Staff
Naval Air Warfare Center - Aircraft Division
48110 Shaw Rd, Unit 5
Patuxent River, MD 20670- 1906
(301) 342-8395 DSN 342; FAX (301) 342 - 8801
biggerstaffs@navair.navy.mil

Chair Select (Air Force)

James C. Miller, Ph.D., CPE
Director, Chronobiology and Sleep Lab
AFRL/HEPM
2504 Gillingham Drive, Ste 25
Brooks AFB, TX 78235
(210) 536-3596 DSN 240; FAX (210) 536-2761
jcmiller@brooks.af.mil

Immediate Past Chair (Army)

Dr. James C. Geddie
2002 Antelope Trail
Harker Heights, TX 76548-2164
(254) 698-6405
geddie.hsiac@usa.com

NASA Representative

Ms. Faith Chandler
NASA Headquarters
300 E. Street, SW
Washington, DC 20546
(202) 358-0411;FAX (202) 358-2778
fchandle@hq.nasa.gov

Army Representative

Ms. Dawn Woods
AMSSB-RSS-E(N) Attn: Dawn Woods
100 Kansas St.
Natick, MA 01760-5020
(508) 233-5069 DSN 256; FAX (508) 233-6472
dawn.woods@natick.army.mil

Navy Representative

LCDR Dylan Schmorrow
DARPA/ITO
3701 North Fairfax Drive
Arlington, VA 22203-1714
(703) 696-0360 DSN 754
dschmorrow@darpa.mil

Air Force Representative

Dr. Kristen Liggett
AFRL/HECI, Bldg. 33
2210 Eighth Street
Wright-Patterson AFB, OH 45433-7022
(937) 255-8251 DSN 785; FAX (937) 656-4547
kristen.liggett@wpafb.af.mil

FAA Representative

Dr. Thomas McCloy
FAA; AAR-100, Rm. 907
800 Independence Ave., S. W.
Washington, DC 20591
(202) 267-7167; FAX (202) 267-5797
tom.mccloy@faa.gov

Ex Officio Members - SubTAG Chairs

Controls and Displays (Controls)

LT Chris Hart
48110 Shaw Rd., Unit 5
Bldg 2187, Suite 2280
Patuxent River, MD 20670-1906
(301) 342-9254 DSN 342; FAX (301) 342-9305
hartcl@navair.navy.mil

Design: Tools and Techniques (Design)

Mr. John Lockett
ARL-HRED
Attn: AMSRL-HR-MB
Aberdeen Proving Ground, MD 21005-5425
(410) 278-5875 DSN 298; FAX (410) 278-5032
jlockett@arl.army.mil

Human Factors Engineering/Human Systems Integration: Management and Applications (HSI)

LT Sidney Fooshee
NAWCTSD, Air 4962
12350 Research Parkway
Orlando, FL 32826-3261
(407) 380-4258; FAX (407) 380-4007
sidney.fooshee@navy.mil

Human Factors in Extreme Environments (Environments)

Mr. Brad Collie
US Navy Coastal Systems Station, Code E31
6703 West Highway 98
Panama City, FL 32407-7001
(850) 234-4744; FAX (850) 235-5152
colliebe@ncsc.navy.mil

Human Factors in Telemedicine and Biomedical Technologies (Biomed)

LT Walter Carr
Naval Health Research Center
P.O. Box 85122
San Diego, CA 92186-5122
(619) 553-0479 DSN 553; FAX (619) 553-8551
carr@nhrc.navy.mil

Human Factors Standardization (HFS)

Mr. Alan Poston
Federal Aviation Administration, AND-202
800 Independence Ave. SW, Rm 339
Washington, DC 20591
(202) 493-4519
alan.poston@faa.gov

Human Factors Test & Evaluation (T&E)

Ms. Lisa Achille
21544 Breton View Court
Leonardtown, MD 20650
(301) 342-9706 DSN 342; FAX (301) 342-9708
achillelb@navair.navy.mil

Human Modeling and Simulation (Modeling)

LT Joseph Cohn
Naval Research Laboratory, Code 5580
4555 Overlook Ave. SW
Washington, DC 20375-5320
cohn@ait.nrl.navy.mil
(202) 253-1291

Sustained/Continuous Operation (SUSOPS)

Co-Chairs:

James C. Miller, Ph.D., CPE
Director, Chronobiology and Sleep Lab
AFRL/HEPM
2504 Gillingham Drive, Ste 25
Brooks AFB, TX 78235
(210) 536-3596 DSN 240; FAX (210) 536-2761
jcmiller@brooks.af.mil

Thomas E. Nesthus, PhD
Human Factors Research Laboratory
FAA CAMI
PO Box 25082
Oklahoma City, OK 73125
(405) 954-6297; FAX (405) 954-4852
tom.nesthus@faa.gov

System Safety/Health Hazards/Survivability (SS/HH/Sv)

Mr. Benjamin Gibson
AMEDDC&S`
14723 Oak Briar
San Antonio, TX 78232-4679
(210) 221-1622 DSN 471; FAX (210) 221-0121
ben.gibson@amedd.army.mil

Technical Society/Industry (TSI)

Mr. Stephen C. Merriman, MS 269
The Boeing Company c/o Raytheon TI Systems
P.O. Box 660246
Dallas, TX 75266-0246
(972) 344-7578; FAX (972) 664-0092
scmerriman@attbi.com

Tri-Service Workload Coordinating (Workload)

Dr. Michael Vidulich
AFRL/HECP
2255 H St
Wright-Patterson AFB, OH 45433-7022
(937) 255-8734 DSN 785; FAX (937) 255-8752
michael.vidulich@he.wpafb.af.mil

User-Computer Interaction (UCI)

LT Jim Patrey
HQ USAFA/DFBL
2354 Fairchild Drive
USAF Academy, CO 80840-6228
(719) 333-9891 DSN 333; Fax: (719) 333-6711
Jim.Patrey@usafa.af.mil

Affiliated Groups (NO VOTE)

Human Factors in Training Interest Group (Training)

Dr. Bob Nullmeyer
AFRL/HEA
6030 S. Kent St.
Mesa, AZ 85212-6061
(480) 988-6561 x283 DSN 474; FAX (480) 988-6285
bob.nullmeyer@williams.af.mil

Table of Contents

Meeting Agenda

Monday, 4 November

0800 - 1000 Executive Committee meeting
1000 - 1100 New member orientation
1100 - 1300 Luncheon Break
1300 - 1700 Plenary Session

- Call to Order –LCDR Sean Biggerstaff
- Homeland Security, USAF Perspectives - Lt Col Michael R. Fox, Chief, Homeland Defense and Joint Actions, Directorate of Homeland Security, HQ United States Air Force
- The US Army's Medical Communications for Combat Casualty Care (MC4) - Orlando J. (Orie) Illi, Jr., Deputy Program Manager-MC4, MC4 Product Office, Fort Detrick
- Decision Support Tools in the Space Shuttle Glass Cockpit – Dr. Robert S. McCann, Principle Investigator, Intelligent Spacecraft Interface Systems (ISIS) Laboratory, Human Automation Branch, NASA Ames Research Center
- The Role of Decision Support Systems in Aviation Security – Dr. Sandra Hart, NASA-Ames Research Center (MS 262-11), Moffett Field, CA
- MC2C and C^4ISR: An Impending Revolution in the Human-machine Interface - LtCol Brian Donnelly, Deputy Chief, Crew Systems Interfaces Division, Air Force Research Laboratory
- MANPRINT Update - Dr. Michael Drillings, Deputy Director MANPRINT Office, Pentagon
- NAVSEA 03--Human Systems Integration Directorate – Mr. J. Robert Bost, Technical Director, SEA 03
- Air Force Human Systems Integration Update - Major Lindberg, Brooks AFB

Tuesday, 5 November

0730 - 0830 Technical Society/Industry
0830 - 1100 Human Factors Test and Evaluation
0830 - 1100 Sustained/Continuous Operations
0930 - 1000 Networking, coffee
1100 - 1230 Luncheon Break
1100 - 1230 Working Session/Technical Assessment: Warrior Readiness – Joint Warfighter Capabilities and Objectives (WR JWCO) Document
1230 - 1430 Human Factors Standardization
1230 - 1430 Controls and Displays/Voice-Interactive Systems
1430 - 1500 Networking, coffee
1500 - 1700 Human Factors in Extreme Environments
1730 - 1830 Service Caucuses & Technical Society/Industry Meeting

Wednesday, 6 November

0830 - 1100 Human Modeling and Simulation
0830 - 1100 Tri-Service Workload Coordinating
0930 - 1000 Networking, coffee
1230 - 1430 Design: Tools and Techniques
1230 - 1430 User-Computer Interaction
1430 - 1500 Networking, coffee
1500 - 1700 Human Factors Engineering/Human Systems Integration: Management and Applications
1500 - 1700 System Safety/Health Hazards/Survivability

1800 - 2100 Tour of Mount Vernon

Thursday, 7 November

0830 - 1000 Operating Board
1015 - 1200 C^4ISR Knowledge Base Development Team Meeting
1000 Meeting adjournment

Plenary Session

The following briefing summary written by Steve Merriman

- Homeland Security, Air Force Perspectives - Lt Col Michael R. Fox, Chief, Homeland Defense and Joint Actions, Directorate of Homeland Security, Deputy of Air and Space Operations, Headquarters United States Air Force; 1840 N. Nash Street, Suite C-100, Arlington, VA 22209; (703) 696-4061; MichaelR.Fox@pentagon.af.mil.

Lt Col Fox's briefing provided an overview of homeland security (HLS); including a history of pre- and post-9-11 activity, and some challenges specific to defense and air defense roles and missions. Efforts related to homeland security began well before 9-11. In particular, three congressionally chartered commissions (Gilmore, Bremer, and Hart-Rudman) dealing with weapons of mass destruction, terrorism, and national security all predated 9-11. Additionally, within DoD, the National Defense Panel, the Joint Staff Full Dimensional Protection Joint War fighting Capabilities Assessment, the Quadrennial Defense Review, and, within the AF, the AF HLS working group, predated 9-11 as well. However, the attacks of 9-11 fundamentally changed our perceptions in that terrorists, no longer satisfied with making mere political statements, were attempting, with some degree of success, to undermine our national security at the strategic level. One fundamental precept, first articulated by Hart-Rudman, is that the resources of DoD alone would not be sufficient to counter the threat. HLS is inherently an interagency activity. DoD's role is limited to 1) traditional military activities under extraordinary circumstances; 2) support to other agencies in emergency circumstances; and 3) on a temporary basis for special events such as the Olympics. Airmen believe that air and space power can uniquely contribute to HLS through its speed, range, and flexibility. The air and space power response immediately after 9-11 was evidenced by the rapid expansion of aircraft on alert from 14 to hundreds in a matter of hours as well as on-going efforts to augment NORAD's radar picture with FAA internal radars. After 9-11, the '02 Unified Command Plan created a new combatant command, USNORTHCOM, charged with defending Americans where they live and work. The AF, as a part of its restructuring its requirements process, created the HLS Task Force CONOPS, to ensure that HLS requirements were institutionalized an as AF focus mission. Lt Col Fox closed by presenting two challenges for the HLS community: First, how can one plan for the unexpected; and second, how can one truly integrate all of the elements of national power, as suggested by Hart-Rudman, without jeopardizing American civil liberties. Finally, Lt Col Fox stressed the imperative that the danger is real, present and threatens the whole of our national security.

The following briefing summary written by Steve Merriman

- US Army Medical Communications for Combat Casualty Care (MC4) - Orlando J. Illi, Deputy Program Manager, MC4 Product Office.

The objective of MC4 is to provide near real-time medical information to support command and control, situational awareness and understanding on the battlefield. The development decision is scheduled for 05 November 2002. Details may be obtained from https://www.mc4.army.mil. Relevant references are:

  - 8 November 1997 Presidential Directive
  - Public Law 105-85-Section 765
  - Amendment of Chapter 55 of Title 10 USC

Some of the expected benefits of MC4 are:

- Reduced deployment processing
- Reduced combat morality and morbidity
- Improved accountability for wounded
- Near real time digital CHS information
- Improved trend analysis of health care encounters
- Reduced forward medical shortages

The following briefing summary written by Steve Merriman

- Decision Aiding in Shuttle "Glass Cockpit" - Robert S. McCann, NASA Ames (rmccann@mail.arc.nasa.gov) and Jeffery McCandless, San Jose State University.

Two of the Space shuttles are still equipped with the original 3-CRT cockpit! The remaining shuttles are fitted with nine flat panel displays. However, in order to minimize the impact of the new technologies, most of the old CRT displays were carried over to the new displays. Over the last two years, Johnson Space Center personnel have worked to define new display that will take advantage of the new flat panel color displays. Tasks are to consolidate and better arrange displayed information, make better use of graphical display capabilities and make good use of color. Goals are to improve Situational awareness (SA), reduce workload and improve overall performance. The timetable is to complete format programming and evaluation by 2004, implement the new formats by 2005 and fly them in 2006.

The following briefing summary written by Steve Merriman

- Decision Support to Aviation Safety - Dr. Sandra Hart, NASA, Ames Research Center

Patterns and sequences of events in combination threaten aviation safety more that all the man and machine problems to be encountered. Dr. Hart's presentation discussed human factors support to aviation safety in contrast to what is needed in support of aviation security. There are major differences also areas where aviation security can benefit from human factors' experiences. Human factors efforts in the aviation safety arena have, so far, achieved very high safety levels. Opportunities for human factors relative to the security threat are diverse, ill defined and evolving. "Protection in depth" does not exist in aviation security anywhere close to the level currently achieved in aviation safety.

To compare and contrast aviation safety and aviation security domains:

Aviation Safety	Aviation Security
Errors just 'happen'	Security breeches are deliberate
Timing is completely unpredictable	Timing is unpredictable (for aviation personnel)
Situation may be recoverable	Situation may not be recoverable

The message is that a lot of human factors expertise has been applied to aviation safety, much of which could also be applied to aviation security with positive result. Human factors community can infuse the rush to technology with common sense to help mitigate against unintended consequences and offer alternatives.

- MC2C and C4ISR: An impending Revolution in the Human-machine Interface - Brian P. Donnelly, Lt Col, USAF, Deputy Chief, Crew System Interface Division, AFRL/HEC, 2255 H Street, Wright-Patterson AFB, OH 45433-7022, (937) 255-7573, DSN: 785-7573, brian.Donnelly@wpafb.af.mil

While the Multi-sensor Command and Control Constellation, or MC2C, represents an evolutionary change with respect to how we connect the multitude of systems that comprise the command and control element in a theater of operations, it also represents a revolutionary change in the method of how that command and control will be enabled and executed. Historically, to include the present, battle management has been an intensely human-in-the-loop (HITL) operation: humans control surveillance and intelligence assets to collect data within an Area of Responsibility (AOR), they in most cases mentally correlate subsets of that vast superset of data, and they use that information to conduct any of a number of command and control functions. This revolution will be a product of migrating away from the manual HITL paradigm, and towards increasingly automated machine-machine resource management and mission execution with HITL operations occurring at a higher, supervisory level. Information that historically was obvious to operators because it was part of their own cognitive processes will have to be gleaned from databases created by expert systems, or presented in ways to obviate their pedigree or source of derivation. As the constellation evolves toward greater interoperability—coupling nodes more tightly—patterns or standards will emerge in how the "expert" logic is developed and embedded within systems, so that across the battlespace systems "think" alike and prioritize their workload and communications towards the same goals (the Joint Force Commanders objectives and intent), as closely as possible to how operators themselves would react given the same information. Most dramatically, the constellation's evolution toward increasing connectivity and interoperability will lead to greater information flow across the network of systems, making information available where historical limits in bandwidth prevented it from being shared. This aspect of the revolution increases the potential for information overload and thus will necessitate greater need for natural interfaces so that operators can find information "where it makes sense to look for it." Given this revolution, there is a great need for an increasing focus and integration of human effectiveness research and human factors engineering. If this can be accomplished simultaneously to the recent explosion in CONOPS development and subsequent system design, the systems we produce will live up to the expectations and requirements of the transformation of our fighting forces.

- MANPRINT Update - Dr. Michael Drillings, Deputy director of the US Army's MANPRINT Office, Office of the Deputy Chief of Staff, G-1, DAPE-MR, Army, Pentagon.

MANPRINT is the Army's implementation of the DoD Human Systems Integration (HIS) program. Initial implementation of MANPRINT on the Apache program resulted in about $3 billion in cost avoidance. The MANPRINT office is staffed with only 4-6 professionals. The program management offices and contractors actually "do" the MANPRINT activities with the MANPRINT office providing guidance and advice. Army Regulation 602-1 (1 June 2001) provides the requirements for MANPRINT. The MANPRINT office is expanding its responsibilities to include the application of 'cognitive engineering' principles to minimize soldier cognitive workload and task complexity on the job.

The following briefing summary written by Steve Merriman

- NAVSEA-03: Human Systems Integration Directorate - Mr. J. Robert Bost, Technical Director, NAVSEA-03

Manpower, personnel and training have been moved out of "supportability" and into the new SEA-03 HSI Directorate. SEA-03 is now focusing on 'sailor performance.' Key responsibilities of the new directorate are:

- Policy, performance standards, processes and technical standards
- Accountability for implementation and effectiveness (HIS advocate)
- HIS investment strategy to shape the future

Mr. Bost reminded everyone that 71% of the Navy TOA (Total Obligational Authority) is related to **people.** NAVSEA recognizes this and decided to concentrate it's HSI resources in a single directorate to ensure maximum concentration coordination of people-related efforts. Mr. Bost also reminded the audience that there would be an HSI symposium (the theme is "Enhancing Human Performance in Naval & Joint Environments") in June 2003 at Tyson's Corner, Virginia.

- Air Force Human Systems Integration Update – Major Bob Lindberg, Chief, Acquisition & Environmental Planning, 311 HSW/XPRA, 2510 Kennedy Circle, Suite 116 Brooks AFB, TX 78235-5115, (210) 536-4457 DSN 240; FAX: (210) 536-4475

The 311th Human Systems Wing Acquisition and Environmental Planning Office will highlight the Human Systems Integration (HSI) activities within the Air Force. Currently, the Air Force is involved in reviewing Operational Requirements Documents, consultations to program offices, managing a new HSI e-learning course, and establishing a Joint HSI community of practice. Discussion on each topic will provide insight into how HSI is accomplished within a system that promotes decentralized execution.

Controls and Displays

No report submitted.

Design: Tools and Techniques

Overview
This meeting of the subTAG was focused on coordination of MicroSaint-based Human Performance Modeling and Simulation Tools.

Human Performance Modeling and Simulation is a critical technology for achieving the system performance capabilities envisioned in the transformation of U.S. and NATO forces. Recognizing this, the U.S. Army, Navy, and Air Force as well as the U.K. and Canadian Ministries of Defense have sponsored development of powerful task network modeling tools based around the MicroSaint simulation engine. Leveraging, coordination and collaboration in development of the tools has been significant but there have been few opportunities for all of the proponents for these programs to meet at the same time to share information and plan. At this meeting of the DTT subTAG, an overview of the objectives and capabilities was presented. Then the proponent for each tool provided an update on status, current activities and plans for future development. The presentations were followed by a discussion of opportunities for program leveraging, coordination and collaboration. Ideas discussed included writing a book about the tools and presenting case studies of their application. Mr. Lockett volunteered to serve as editor for the book.

Tools represented at this special double session included:
IPME (CA and UK)
C3Trace
IMPRINT
CART
Smart Build 3

Business
Both Mr. Lockett and Mr. Jee are no longer able to serve as subTAG co-chairmen and leadership of the subTAG is due to rotate to the Air Force. Attempts to nominate a chair elect at the SubTAG and through the Air Force caucus were unsuccessful.

Human Factors Engineering/Human Standards Integration: Management and Applications

Presentations

- Augmented Cognition - Colby Raley, Strategic Analysis, 3601 Wilson Boulevard, Suite 500, Arlington, VA 22201, 571-218-4310, craley@snap.org
Amy Kruse, Ph.D., Strategic Analysis, 3601 Wilson Boulevard, Suite 500, Arlington, VA 22201 571-218-4338, akruse@snap.org, LCDR Dylan Schmorrow, Ph.D., DARPA/IPTO, 3701 North Fairfax Drive, Arlington, VA 22203, 703-696-4466, dschmorrow@darpa.mil

The goal of the multidisciplinary Augmented Cognition (AugCog) program is to enhance the warfighter's cognitive capacity and capability under complex operational and stressful conditions. Military operators are often placed in complex human-machine interactive environments that have been shown to fail when a stressful situation is encountered. The technologies under development in AugCog have the potential to enhance operational capability, support reduction in the numbers of persons required to perform current functions, and improve human performance in cognitively challenging environments.

This program will develop the means to measure a subject's cognitive state non-invasively in real-time. By accessing the cognitive state of the individual in real-time, automated computational systems will be able to use that information to modify and mediate cognition. This represents a new paradigm for human-computational systems interfaces. These cognitive systems will provide operational data in a manner specifically targeted to the user – and in a way that will not disrupt the user's current functions. This new interaction will be significantly more potent than just the simple sum of a brain and a computer system, it will achieve an increase the overall system IQ, capitalizing on the synergistic effect of this new human computer symbiosis.

The Augmented Cognition program will move beyond simply redesigning human-computer interfaces by completely recreating them with the state of the human as an integral component. This research will enable development of closed loop human-computer technologies, where the state of the user is measured, analyzed and automatically adapted to by the computational system. Success will improve the way 21st Century warriors interact with computer based systems, advance systems design methodologies, and fundamentally re-engineer military decision making processes.

- Acquisition Policy and MANPRINT - Marjorie Zelco, Program Analyst, HQDA, Army G-1, MANPRINT Directorate, 300 Army Pentagon , Washington, DC 20310-0300, (703) 695-2146; DSN: 225-2146 FAX: (703) 695-8411 marjorie.zelko@hqda.army.mil

Human Factors in Extreme Environments

No report submitted.

Human Factors in Telemedicine and Biomedical Technologies

This subTAG did not meet at TAG-48.

Human Factors Standardization

The Human Factors Standardization (HFS) SubTAG met on November 5, 2002 with 17 attendees. Following an introduction of the attendees, the SubTAG proceeded through its agenda.

Status Reports:

a. MIL-STD-1472F, Human Engineering: Mr. Alan Poston announced that attempts to have MIL-STD-1472 redesignated as an Interface Standard were unsuccessful. After receiving positive feedback from the Defense Standardization Program Office and the Preparing Activity (the Army's Aviation and Missile Command), Mr. Poston had several meetings with the Army Standardization Executive (Mr. Barnett) seeking someone to champion the document through the service standardization executives.

One of the arguments for the redesignation was that MIL-STD-1472 was originally misclassified and the contents of the document is more in line with the definition of an Interface Standard than that of a Design Criteria Standard. It should be noted that during the early days of acquisition reform, there were those that wanted MIL-STD-1472 canceled while others wanted the document retained as an Interface Standard. The designation as a Design Criteria Standard was agreed as a compromise.

A second argument was that without solid human performance requirements, compliance to "good" or "accepted" human engineering practice is open to interpretation by the contractor. Industry wants to promote the perception that government oversight is not needed on performance-based acquisitions. As a result, the government has little recourse for the contractor's failure to perform. It was argued that human performance aspects cannot be left to chance, and that the human engineering practitioners need tools such as MIL-STD-1472 to ensure that human performance will support system performance goals.

The major concern raised with the proposal to redesignate MIL-STD-1472 was that there is a cost premium associated with the application of MIL-STD-1472 in acquisition contracts. This notion came from a Coopers and Lybrand study conducted during acquisition reform in which industry identified MIL-STD-1472 (and a number of other standards) as cost drivers. It was pointed out that the Coopers and Lybrand study listed MIL-STD-1472 as #58 on a list of 105 cost drivers. Furthermore, the study estimated that human engineering requirements added a 0.5 percent cost premium to the research and development (R&D) cost. Mr. Poston argued that 0.5 percent of the program's R&D cost is typically not a large number. However, given that operations and support costs are much greater than R&D costs, early assessment of lifecycle costs have significant benefits to total program costs. Decisions made with little regard to human capabilities and limitations may cause expensive solutions (e.g., equipment changes, developing or modifying procedures, increasing staffing levels, requiring skills not in the current workforce, increasing training requirements). It was argued that the proper application of human engineering costs very little when included from the beginning, and while there may be a small increase in the R&D cost, the application of MIL-STD-1472 will lead to a savings in total program costs.

Mr. Barnett asked if there were examples of programs that incurred costs due to the inability to apply MIL-STD-1472 on a contract. The U.S. Army Research Laboratory - Human Research

and Engineering Directorate (ARL-HRED) was contacted in an attempt to gather these examples. None were provided. Mr. Poston then made some personal contacts in order to gather examples, but the listing was sparse. In the end, the examples were insufficient to convince Mr. Barnett. Without his support to carry the issue forward, further attempts to have MIL-STD-1472 redesignated will have to be put on hold.

Mr. Poston noted that both the Army and the Navy have a Department-wide waiver to MIL-STD-1472. The waiver means that MIL-STD-1472 can be made contractually obligatory in a solicitation; however, other problems still exist. The fact that MIL-STD-1472 has been exempted from the waiver process within the Army and Navy does not change its fundamental classification as a Design Criteria Standard. As a result, the impact on the classification of a specification (detail or performance-based) is also unchanged. A Design Criteria Standard cannot be referenced in a performance-based specification without changing its classification to a detail specification. However, an Interface Standard can be referenced in a performance-based specification without changing its classification.

At the May 2002 meeting, a question was raised regarding population ranges. To recap, para 5.6.2.1 of MIL-STD-1472 states in part "Under ordinary situations, the total percentage of men excluded by the design for all physical factors (size, weight, reach, strength, and endurance) shall not be greater than 5 percent, and the total percentage of women excluded by the design for all physical factors (size, weight, reach, strength, and endurance) shall not be greater than 5 percent." There were differences of opinion as to what this requirement really meant.

In researching the problem, it was discovered that there was an omission in Table I of MIL-STD-1472. Table I identifies changes that should be made to the requirements where exclusive use by male personnel is specified. Table I should have indicated that, when dealing with a male only population, five percent should be changed to 10 percent. This change was in the "E" revision of MIL-STD-1472, but somehow got lost in the "F" revision.

In reviewing para 5.6, it appears that there are several other provisions that might require clarification. Among these are multiple dimension accommodation (para 5.6.3.1.5) and break strength (para 5.6.4.2). It would be inappropriate for the SubTAG to develop proposed wording changes without considering the entire paragraph on accommodation. As a result, Mr. Poston indicated that he would send para 5.6 to the SubTAG membership for review and comment.

b. GEIA Bulletin, Human Engineering Principles and Practices: Mr. Poston announced that this document was published in June 2002. The publication of this document now provides an industry document (non-government) that is available for use in government contracts. The document is designated as Electronics Industries Alliance (EIA) Engineering Bulletin HEB1 and is available at a cost of $50.00. The SubTAG's web site provides a link for the purchase of this document.

c. MIL-STD-1787C, Aircraft Display Symbology: No report was available.

d. MIL-STD-882D, Standard Practice for System Safety: In the absence of Dr. Mark Brauer, Mr. Poston reported that a formal change request has been forwarded to the Preparing Activity (in this case, the Air Force). The proposed change consists of a new appendix that provides guidelines for considering a Human Exposure dimension to the existing Severity and Probability dimensions when assessing the risk posed by a system.

e. HFES/ISO/TC 159: Mr. Richard Armstrong reported that Human Factors and Ergonomics Society (HFES) funding problems limit the ability to provide the needed support to standardization activities. Mr. Armstrong briefly summarized the status of key HFES standardization documents. HFES 100, Human Factors Engineering of Computer Workstations, was issued as a trial use standard in March 2002. HFES 200, Visual Display Terminal Software, has been submitted for final review. HFES 300, Guidelines for Using Anthropometry in Product Design, is being prepared for final review. HFES 400, Guidelines for Instruction Procedures for Commercial Products, is currently on hold.

Mr. Armstrong also summarized International Organization for Standardization (ISO) TC159 (Ergonomics) activities. Subcommittee (SC) 3, Anthropometry and Biomechanics, is working on Ergonomics Procedures for the Improvement of Local Muscular Workloads. SC4, Ergonomics of Human-System Intercations, is working on documents for hardware, software, and visual displays. SC5, Ergonomics of the Physical Environment, is working on a document addressing the thermal environment.

f. Joint Service Specification Guide – 2010: No report was available.

g. NASA Man-Systems Integration Standards (NASA-STD-3000): Dr. Mihriban Whitmore reported that the MSIS ("Man-System Integration Standard" or NASA-STD-3000) is an implementation standard for spacecraft man/machine interface design. The document is currently written primarily as a hardware design tool and set of standards. Involvement with the International Space Station (ISS) program indicated the MSIS requirements wording needs considerable work. The MSIS needs to be a living document evolving with new information as it develops, particularly on-orbit "lessons learned". The Habitability and Human Factors Office (HHFO) at NASA Johnson Space Center has an implementation plan to update MSIS and place it on-line. The update plan includes adding new topic areas and standards derived from core knowledge base, capturing new data from spaceflight-NASA/Mir, ISS and space human factors engineering (SHFE) research developments. In addition, it is planned to add rationale, history and verification data for each requirement, as well as to hyperlink requirements to supporting evidence and/or research if possible. It is intended that the updated MSIS will serve as both a requirements and a lessons learned document. As part of this effort, the HHFO plans to engage external, expert and user communities.

h. Data Item Descriptions (DIDs): Ms. Marcie Langelier indicated that the Naval Air Systems Command (NAVAIR) has almost completed the necessary steps to have the human factors-related DIDs transferred to the Navy. The NAVAIR Crew Systems Department will be assuming the role of Preparing Activity the Human Engineering Program Plan (DI-HFAC-80740), Human Engineering Simulation Concept (DI-HFAC-80742), Human Engineering Systems Analysis Report (DI-HFAC-80745), Human Engineering Design Approach Document – Operator (DI-HFAC-80746), Human Engineering Design Approach Document – Maintainer (DI-HFAC-80747), and Critical Task Analysis Report (DI-HFAC-81399). All that remains are some minor edits, after which the DIDs will be sent to the Navy Data Manager, and then to the DoD Assist Program.

i. Index of Non-Government Standards: The original Index of Non-Government Standards was prepared by the Technical/Society Industry (TS/I) SubTAG in November 1995, and was revised in May 1997. In a coordinated effort between the TS/I and the Human Factors Standardization SubTAGs, the Index has been updated. Using the services of a NASA Summer intern, all titles were verified and changes made as necessary, information regarding each standard's revision and/or release date was updated, new standards were added, information

indicating the organizational website link was added, a notation identifying which standards are available via NASA's Online Standard Library was added, and standards that are obsolete or unavailable were deleted. In addition to identifying the standards that are available through NASA's library, the Index identifies those standards that have been adopted by the DoD, and those standards that are cited by a human factors standardization area document as either an applicable or source document. A new column was added to the listing of standards that contained an organizational website link to indicate where each standard could be obtained. Draft standards are listed separately. The separate listing serves as a reminder to the reader that the standards have not yet been approved, and agreement may never be reached. Additionally, draft standards may be difficult to obtain. Copies of the revised Index were distributed, and the Index will be posted on the SubTAG's web site.

Ms. Faith Chandler informed the SubTAG that many standards are available to government employees through NASA's Online Standard Library. The NASA Technical Standards Program website provides a one-stop shop to the Agency-wide Full-Text Technical Standards System. Most of the standards that are found in the Index can be retrieved and viewed via NASA's Online Library. Government employees can gain access to the site by going to http://standards.nasa.gov/NPTS/public_login.taf. The site will guide one through the registration process.

Other Business:

a. Chair Select: Mr. Poston noted that the SubTAG Charter calls for election of a Chair Select at the fall meeting of even numbered years. This means that there should have been an election at this meeting. However, no nominations were put forward. As a result, election of a Chair Select will have to be delayed until the Spring 2003 meeting.

b. *Gateway* Issue on Human Factors Standardization: Mr. Tom Metzler, Director of the Human Systems Information Analysis Center (HSIAC), offered to dedicate an entire issue of *Gateway* to the human factors standardization area. The focus would look at how standardization has changed because of acquisition reform, and discuss some of the current directions and trends. Mr. Metzler noted that *Gateway* is distributed to 9,000 people quarterly and is a good mechanism for spreading the word about what is happening in the standardization arena. The SubTAG accepted Mr. Metzler's offer; Mr. Poston will be the guest editor for this issue. Mr. Poston took the action to contact various individuals to solicit articles for inclusion. The June 2003 issue of *Gateway* is the target.

c. SubTAG Web Site: Mr. Poston gave an overview of the SubTAG web site. The site is a public site and can be found at http://dtica.dtic.mil/hftag/hfs.html. It contains a mission statement, standardization documents (Human Engineering Design Data Digest, Index of Non-Government Standards, and a link to purchase the Human Engineering Principles and Practices), data item descriptions (current DoD, FAA, and the draft NAVAIR), standards and handbooks (MIL-STD-1472, MIL-STD-1474, MIL-HDBK-759, MIL-HDBK-1908, MIL-HDBK-46855, and NASA-STD-3000), SubTAG meeting minutes, and SubTAG hot issues. NOtices and requests for information can be posted to the web site bulletin board feature, when activated. Additional links can be made to HSIAC and the Human Factors and Ergonomics Society (HFES) Newsletter.

d. New Defense Acquisition Policy: Mr. Poston noted that the 5000-series defense acquisition policy is being revised. A memorandum, dated October 30, 2002, and signed by the Deputy Secretary of Defense cancelled DoD Directive 5000.1 (The Defense Acquisition

System), DoD Instruction 5000.2 (The Operation of the Defense Acquisition System), and DoD 5000.2-R (Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information Systems (MAIS) Acquisition Programs effective immediately. The reason stated was to "create an acquisition policy environment that fosters efficiency, flexibility, creativity, and innovation."

Interim guidance was attached to the memo. Tab G of Attachment 2 (Operation of the Defense Acquisition System) of the memo outlines Human Systems Integration (HSI) Procedures. Under the HSI procedures are human factors engineering; personnel; habitability; manpower; training; environment, safety, and health; and survivability. A copy of the memo and Tab G were distributed.

There was a brief discussion on the impact of the new policy on standardization. Based on past experience, as the policy provides less and less guidance, and gives the contractor more and more discretion, standardization seems to fall by the wayside. Experience also indicates a number of acquisition programs that have suffered due to the lack of standardization.

e. Index of Government Standards: Having updated the Index of Non-Government Standards, it was suggested that it might be worthwhile to prepare an Index of Government Standards. The initial scope of such an Index would be documents prepared by U.S. government activities. Hearing no opposition to the proposal, Mr. Poston indicated he would work on developing an initial draft and circulate it to the SubTAG for review and comment.

Human Factors Test and Evaluation

Presentations

- Analysis of Advanced Technology Needs for Air Force Flying Training - Maj Terence Andre, Chief, Warfighter Skill Development & Training Branch, Air Force Research Laboratory, Warfighter Training Research Division, 6030 South Kent Street, Mesa AZ 85212-6061

The primary objective of this study was to identify ways that new simulation technologies could be used to enhance flying training within the U.S. Air Force (USAF), Air Education and Training Command (AETC). Researchers from the Air Force Research Laboratory (AFRL) conducted a survey development workshop with experienced instructor pilots (IPs) to identify the most significant training requirements and tasks for T-6, T-38, T-1A, AT-38B, T-38C, F-15, and F-16 aircraft training courses. The internet-based survey collected completed responses from over 700 instructor pilots across the U.S. Air Force. The survey was designed to collect ratings on task difficulty, syllabus time allocation, how often tasks contribute to busted check rides, proficiency of graduates, and the adequacy of current simulation devices. This data was to identify the more critical training needs and an index was developed from the ratings to use as a priority weighting criteria in the subsequent Quality Function Deployment (QFD). Instructor pilot participants of the QFD workshop assessed how useful 27 different advanced simulation technologies would be for training each task. The priority weights were then used as multipliers for each technology score to yield total weighted scores for each technology. This analytic process yielded valuable information to aid leaders in making decisions about technology investment.

- Army Software Blocking Process - Stan Levine, Science & Technology, Dept of the Army, G8 DAPR-FDT, 700 Army Pentagon Washington DC 20310-0700, [Taylor Building Room Rm 10E28 , 2531 Jefferson Davis Highway (Crystal Drive)]

- Achieving Collaborative Knowledge in Asynchronous Collaboration - Dr. Norman W. Warner, Mr. Steve Vanderwalker, Ms. Nina Verma, Naval Air Warfare Center, Aircraft Division, Patuxent River, MD

- Measuring Performance in Intelligence Systems - Dr. Jan Cannon-Bowers, Senior Scientist for Training Systems and Task Force Excel, NAVAIR, Orlando

Human Modeling and Simulation

No report submitted.

Sustained/Continuous Operations

Overview

- Attendance at the subTAG included fifteen members and fifteen non-members. The organizations represented: Air Force Research Laboratory (AFRL), FAA Civil Aeromedical Institute (CAMI), DTIC Human Systems IAC (HSIAC), Walter Reed Army Institute of Research (WRAIR), Naval Submarine Medical Research Laboratory (NSMRL), Naval Postgraduate School, NHRC, AFOTEC, USAARL, and others.
- The agenda covered: new business consisted of requesting input from attendees based on the "TAG issues" paper from LCDR Sean Biggerstaff and from the Hot Issues document. Some comments were provided for inclusion during the discussions at the Operating Board meeting on Thursday.
- Highlights of discussions, recommendations: High praise was provided to the presenters of this meeting in spite of the sustained and continuous operation of the session. Comments were provided for reporting on the TAG issues. No revisions/comments were provided on the "Hot Issues" document.
- Open actions (target dates): proposed SusOps topics/theme—on hold. Requests were made for participants for the Augusta, GA meeting.

Co-Chairs and phones:
Dr. Thomas E. Nesthus, (405) 954-6297
Acting Co-Chair: LT Walter Carr, for Dr. James C. (Jay) Miller, (210) 536-6371 (DSN 240)

Presentations

- An Eye-Witness Report on the Effects of Fatigue on Flight Crew Resource Management: Aircrew Fatigue and the DC-8 Accident at Guantanamo Bay, Cuba, 1993 - Thomas R. Curran FAA/ATL-FSDO-11, College Park, GA

On the 18th of August 1993, at 1654 hours, an American International Airways DC-8 cargo airplane flying from NAS Norfolk, VA, to NAS Guantanamo Bay, Cuba, crashed when the captain lost control of the aircraft while making a visual approach to land on runway 10. This approach required a sharp right turn for final alignment. At about 500 ft the above the airport, the aircraft stalled, rolled into a 60-degree angle of bank, and hit the ground wing tip first. Incredibly, as the airplane cartwheeled along the surface, it narrowly missed an active land mine field by just a few yards. Although seriously injured, the captain, first officer (myself), and the flight engineer survived the crash. Later we were all able to give testimony about the wreck to the NTSB accident investigators. The Board determined that the probable causes of the accident were: "...the impaired judgment, decision making, and flying abilities of the captain and flightcrew due to the effects of fatigue; the captain's failure to assess the conditions for landing and maintaining vigilant situational awareness of the airplane while maneuvering onto final approach; his failure to prevent the loss of airspeed and avoid a stall while in the steep bank turn; and his failure to execute immediate action to recover from a stall."
The Board cited additional contributing factors to the cause as: "...the inadequacy of the flight and duty time regulations applied to 14 CFR, Part 121, Supplemental Air Carrier, international operations, and the circumstances that resulted in the extended flight/duty hours and fatigue of the flightcrew members." The Board also noted that the flightcrew had been on duty about 18 hours and had flown approximately 9 hours at the time of the accident.

For the first time ever, the National Transportation Safety Board determined that fatigue was a probable cause of the accident; fatigue played a major role in the Guantanamo crash

- Techniques and Issues Associated with Investigating Fatigue in Aviation Accidents - Malcolm Brenner, Evan Byrne, William Bramble, Human Performance, Office of Aviation, National Transportation Safety Board

Through witness interviews, records, accident site data, and flight recorder information (CVR, FDR), investigators work, where possible, to determine the role of fatigue in aircraft accidents. A thorough investigation of recent activities of the personnel involved can help document the potential for a fatigued state to exist about the time of the accident. Significant markers include hours of continuous wakefulness, accumulated sleep debt, and circadian disruption. Identifying that fatigue was possible is not sufficient, clear documentation that performance was degraded in a manner consistent with fatigue is also necessary. Recorded voice data can be useful in documenting operator state and performance. The nature and content of the communications can be examined, as well as the actual acoustic quality of the speech itself. Additional research is needed to determine to what extent voice data can provide information helpful to investigators in the investigation of fatigue. The presentation discussed the role of fatigue was identified in various aircraft accidents including the DC-8 landing accident in Guam.

- Performance Modeling as a Tool for Effective Fatigue Management and Schedule Evaluation - Steven R. Hursh, Biomedical Modeling and Analysis Program, Science Applications International Corporation

Operator fatigue and time-of-day induced variations in cognitive effectiveness can lead to lapses in attention, slowed reactions, and impaired reasoning and decision-making that has been shown to contribute to accidents, incidents and errors in a host of industrial and military settings. During the past three years, the US Air Force has sponsored the development of a model of human fatigue and circadian variation and a scheduling tool based upon the model that will be used to minimize aircrew fatigue. The initial test version of the tool has passed review by the operational wings of the AF and a final operational product is in advanced development and validation. The software was developed by SAIC and NTI and is called the Fatigue Avoidance Scheduling Tool (***FAST***™). It is based upon a model developed by SAIC (Dr. Hursh) called the Sleep, Activity, Fatigue, and Task Effectiveness (**SAFTE**™) Model and the DOD considers the model to be one of the most complete, accurate, and operationally practical models currently available to aid warfighter fatigue management. The ***FAST***™ scheduling tool uses the model to compare alternative schedules in terms of predicted performance effectiveness and to assess alternative solutions for fatigue avoidance. ***FAST***™ allows easy entry of proposed schedules and generates graphical predictions of performance along with tables of estimated effectiveness scores for objective comparison. Optimal schedules may be selected based on average effectiveness for proposed work periods or mission critical events. For AF combat operations, such as 30 hr bombing missions, the tool has been used to schedule strategic naps to maintain sustained operations.

- Toward a Comprehensive Sleep Management System: An Overview of CONOPS Research at WRAIR - Thomas J. Balkin, Nancy Wesensten, Daniel Redmond, David Thorne, Maria Thomas, Helen Sing, Gary Kamimori, William Killgore, Gregory Belenky Department of Behavioral Biology; Walter Reed Army Institute of Research

Maintenance of alertness and performance during continuous operations requires three capabilities: (a) A method for monitoring sleep in the operational environment, (b) An algorithm for real-time prediction of soldiers' performance capacity based on recent sleep history; and (c) A selection of countermeasures that can be applied as appropriate across the range of operational exigencies. The Sleep Watch provides state-of-the-art capabilities for sleep monitoring and performance prediction in the field, and future research with this device will be conducted with the aim of honing performance predictions for individual soldiers. The aim of current and planned countermeasures research is to determine which alertness-enhancing medications (e.g., modafinil, d-amphetamine, caffeine), sleep-inducing medications (e.g., zolpidem, triazolam, zaleplon), and sleep inducer counteractants (flumazenil) are appropriate for the military's armamentarium, and to model the effects of selected pharmacological agents so that they can be utilized to optimum advantage in the operational environment.

- The Walter Reed Palm-held Psychomotor Vigilance Test - David R. Thorne, Department of Behavioral Biology; Walter Reed Army Institute of Research

We have developed a field-deployable Psychomotor Vigilance Test (PVT) that runs on PDA's using the Palm © operating system. The software can emulate a commercially available PVT device widely used in sleep-deprivation and fatigue research, but provides additional stimulus, feedback, control, and data options. Test parameters can be selected on the device itself or downloaded to multiple devices from a Windows companion program. Data from multiple test sessions (or multiple subjects) are saved on each device and later uploaded to the Windows program, which can export complete or edited raw data, or user-selectable summary statistics in a number of different file formats. The test is currently being validated against the commercial version in a 40-hr continuous sleep deprivation study, using parameter values designed to improve subject acceptance and compliance in the field. Preliminary findings from this study will be presented.

System Safety/Health Hazards/Survivability

Overview
Fourteen people attended the subTAG meeting. They represented the following organizations: Army, Navy, Air Force, Federal Aviation Administration, National Aeronautics and Space Administration, Department of Transportation, Industry, and Independent Consultants.

Business
Mr. Stephen C. Merriman, The Boeing Co, was elected as Co-chair. Mr. Benjamin F. Gibson will remain as the other Co-chair.

This SubTAG submitted a recommended change to Mil-Std 882D, Standard Practice for System Safety. It was rejected by the U.S. Air Force Materiel Command who is the proponent for the Standard. Dr. Mark Brauer and Mr. Al Poston revised the recommendations and it has been resubmitted. It was submitted as an appendix to the Standard. It may be more acceptable in this form. Target date for completion is dependent on acceptance of our recommendation.

Presentations
- Reducing the Effective Slipperiness of CBPS Flooring - Dr. Martha R. Fletcher

Teflon®-coated floorings (Chemlam-X22®(A) and X22(B)) of the Chemical-Biological Protective Shelter System (CBPS) tent system are necessary for decontaminability, but are slippery underfoot. Under normal walking conditions, soldiers wearing ordinary combat boots reported a slipping hazard; under wet conditions with fast-paced movement, footing is expected to become even more precarious. Commercially available non-skid shoe covers were evaluated in the laboratory as a means of reducing the risk of slipping but did not prove to confer any non-slip advantage. Some alternative materials were identified that can be applied as tread to disposable shoe covers and would provide greater wet and dry slip resistance on the CBPS flooring than un-covered combat-boot soles. These solutions may prove useful in other floored shelters where matting or other adaptations are impractical.

- Gravity Induced Loss of Consciousness (GLOC) - Dr. Thomas M. Mitchell

Acceleration or G-induced loss of consciousness (GLOC) has been, and remains an inherent problem in military aviation. The present work was, in part, conducted to address issues that surfaced during an earlier investigation (Deaton and Mitchell, 2000). In response to identified research gaps, the investigators acquired additional data from the Air Force and Navy Safety Centers and conducted extensive interviews with operational and aero medical support personnel. Fifteen separate commands were canvassed. Six tasks were addressed and major findings were:

Task 1: Several factors emerged that were identified by both aero medical and operational personnel as likely explanations for an increased GLOC rate for the T-37: 1) High onset rates; 2) No G-suit protection; 3) Student pilot inexperience; 4) No prior centrifuge training; and 5) Side by side crews. With the introduction of the Joint Primary Aircraft Training System (JPATS) to replace the T-37, the high GLOC rate in the undergraduate pipeline training is expected to be reduced significantly. JPATS aircraft will have lower G onset rates and pilots will wear G-suits.

Task 2: Rates between the USN and USAF were quite close after factoring out the proportion of GLOC events attributable to the basic training community from the operational training data. The main feature that remained was the rather high rate (on the Air Force side) for the training community. Most likely, this was the result of the high GLOC rates found in the T-37 (see Task 1), and the fact that wash-out rates in the Air Force are extremely low today compared to ten years ago; thus, students who are slightly weaker may remain in the flight program, whereas in the past they may have attrited.

Task 3: Mishap data showed that 1990 was a peak year for GLOC related mishaps. The increased rates in 1990 were most likely the result of the Desert Storm/Shield buildup. The reduction in 1991 was a return to average GLOC rates experienced prior to the Gulf War.

Task 4: On the Navy side, student pilots do not get centrifuge training, or close one-on-one training prior to initial flight training. They simply are provided with a brief and are told how to do AGSMs in the company of many others and a classroom instructor. More experienced pilots reported that they titrate the level of straining needed, given the specific situation; this amounts to working "on the edge" in the sense that pilots report they know when to employ an AGSM and how much work to put into it. Several pilots stated that they are not doing the AGSM. In some cases, there are too many other things to do in the flight environment and they do not have time to think about the AGSM. Centrifuge training, as currently taught, does not lead to intuitive AGSM performance. In other words, it does not result in the pilot performing the AGSM in the aircraft without having to consciously think about technique. Not only is more exposure needed in the centrifuge, but the syllabus content of centrifuge training needs to be re-evaluated.

Task 5: The issue of whether Reserves/ANG (Air National Guard) experience a higher incidence of GLOC, due primarily to their reduced flying hours, was inconclusive. It was apparent, however, that pilots generally believe GLOCs will increase if simulator time is substituted for flight time. There may be an exposure factor operating here such that the ability to tolerate acceleration forces degenerates as a function of time in a non-flying status.

Task 6: In both Air Force and Navy communities only a very small proportion of Controlled Flight Into Terrain (CFIT) mishaps were possibly misclassified as CFIT rather than directly GLOC related.

Other Issues: Reporting: The occurrence of GLOC incidents in the cockpit which do not result in an actual mishap is probably significantly under reported. It is estimated that as many as 60% of such incidents are not reported.

Combat Edge: Comments obtained from interviewees were mixed, particularly with regard to the mask. Discussions with operational aircrew revealed that, for the most part, the vest is not being worn as causing body heat buildup.
Centrifuge Training-There appear to be differences between the Navy and Air Force in regards to centrifuge training; not so much in technique as in evaluation criteria. The Air Force has instituted a pass/fail requirement, while the Navy has not established such a criterion. The manner in which centrifuge training is structured does not parallel the "real world" environment in which the pilot is simultaneously involved in several psychomotor and cognitive tasks. That is, the AGSM is practiced in an unrealistic environment such that the transfer of these skills to the cockpit may not be intuitive.

Recommendations: 1) the introduction of more realistic training environments for centrifuge based training; 2) the cross service standardization of centrifuge based training syllabi and policies; and 3) the provision of an additional Navy centrifuge training site.

Technical Society/Industry

Overview
The Technical Society/Industry (TS/I) SubTAG met twice during TAG #48. Thirteen participants attended the meetings, representing five societies/technical groups. Steve Merriman (stephen.c.merriman@boeing.com or scmerriman@attbi.com) chaired the meetings. Attendees introduced themselves and the TS/I membership rosters were updated.

Presentation
Dr. Michael Tulloch, 3 Sigma Research, Inc (mtulloch@tulloch.org) described current research being conducted under a Small Business Innovative Research (SBIR) contract with Rome Laboratories. There are two distinct parts of SBIR: User Interface (UI) component development and a general test environment. The first task was to create novel controls for multi-sensor information. We have generalized the concept of Ben Schneiderman's Alpha Slider to include complex alphanumeric data. Our new "InfoSlider" controls have been developed in Java. Java allows the tool to be easily adapted to a variety of modern programs including HTML based programs.

The InfoSlider will be used as part of Rome Laboratories' J-Views 3-D data display software. J-Views provides very fast three-dimensional rendering of complex data. J-Views is also written in Java. Rome Laboratories recently use J-Views to support activities in Afghanistan by rapid prototyping terrain data. It was use to replace a DSS unable to respond within necessary timeframe.

The second task of the SBIR was development of an environment for testing applications. This environment is a scientifically based Case Study methodology called the Visualization Evaluation Environment or VEE. It contains a methodology used to evaluate and test visualization components. An article by Kitchenham and Pickard ("Case Studies for Method and Tool Evaluation." IEEE Software, July 1995) discusses methods for evaluating software development tools. While their focus was the software development environment, there are many strong parallels to developing multi-sensor analysis programs and software programs. Developers and procurement agencies must move beyond the art of system creation to a scientifically based approach. Based upon this philosophy, VEE provides tools essential for such an effort.

At the end of phase I, a study will be conducted using a preliminary implementation of the InfoSlider, a preliminary implementation of VEE, and VEE measurement components (Question presentation & Response Time measurement). The test procedure was also developed using VEE. The test uses a primitive FAA ARTCC display supporting tasks intended for laymen users.

Old Business
Nominations were solicited for the position of TS/I chair. Mr. William Lytle, representing the Aerospace Medical Association/Human Factors Association was elected by voice vote. Nominations will be solicited at the Spring 2004 meeting, with installation of the next chair at the fall 2004 meeting. Congratulations, Bill!

New Business
Mr. Tom Metzler, HSIAC Director, indicated that there would be a workshop on “Usability Assurance” in about six months. He indicated that some of the British human factors personnel

responsible for authoring a new ISO standard on usability assurance would be requested to make presentations at this workshop.

Web Page - Ms. Teresa K. Alley solicited inputs from the members for the TS/I's web page (http://dtica.dtic.mil/hftag/tsi.html). A variety of announcements, events, publications, etc. are available via the TS/I page.

Non-Government Standards Update - Mr. Alan Poston (alan.poston@faa.gov) indicated that the Index of Non-government standards (NGS) has been completed. Special thanks go to Ms. Faith Chandler (NASA HQ) for her efforts. The updated index will be posted on the TAG's website. This update includes web addresses for each standard as well as addresses for each of the standardization organizations.

Hot Issues - Ms Faith Chandler has authored a form for submittal of new hot issue items.

Success Stories

The Success Stories document, tabled in 1999, may be reactivated. The TAG chair will be soliciting new success stories from the various service representatives and SubTAG chairs in the near future. The TS/I SubTAG has pledged its support to this activity.

Tri-Service Workload Coordinating

Overview
The meeting was organized around presentations of four research reports. All three services were represented.

Presentations
- KC-130J Workload and Manning Assessment - LT Chris Hart (MSC, USNR) & LT Jeff Alton (MSC, USNR)

USMC is taking delivery of KC-130J aerial refueling planes. This new airplane has advanced display and automation that were designed to reduce workload and manning requirements. The Crew Systems Dept at NAVAIR conducted a workload evaluation and manning assessment. Measures of workload indicated that manning requirements were not significantly lowered despite advanced displays and automation.

Crew Size, Composition, and Time: Effects on Behavior and Performance of Team Personnel in Expeditionary Environments - Marilyn Dudley-Rowley (OPS-Alaska and Sonoma State University), Sheryl Bishop (University of Texas-Medical Branch), Stewart Whitney (Niagara University), Patrick Nolan (The University of South Carolina), & Thomas Gangale (OPS-Alaska)

The authors report the results of an ongoing study that investigates the effects of crew size, composition, mission duration, and mission interval on behavior and performance of extreme environment expeditions. The standardized rates for a behavior/performance indicator constructed during the pilot study displayed distinctive patterns across different crew profiles and settings. Then, a further analysis over the missions in the pilot sample found compelling information suggesting that several factors created specific differentials between outside (baseline) groups (e.g., mission controllers, "folks back home") and groups in extreme environments. These differentials reflected how the passage of time was subjectivized by crews and how the expeditionary situation was otherwise defined differently from baseline. These analyses suggest that the definition of "the long-duration mission" likely involves more than the issue of real-time duration.

- Workload Research and U.S. Army Rotary-wing Aviation- CPT Gina E. Adam (US Army Aeromedical Research Laboratory)

The U.S. Army Aeromedical Research Laboratory is housed at Ft. Rucker, AL, the home of Army Aviation. Previous human factors work at the laboratory has focused on such problem areas as sustained operations and spatial disorientation. While researchers and aviators acknowledge the impact of workload on aviation operations, little research has been done to specifically address workload issues. The research presented reviewed efforts to develop awareness of workload and covered upcoming research projects.

- Virtual Air Commanders: DDD Study 1 –Develop Controller Metrics - Michael Vidulich (AFRL/HECP) & Edward Fix (Sytronics)

The Distributed Decision-making (DDD) task was used to test the sensitivity of an integrated performance measure to interface manipulations in a generic Unmanned Combat Aerial Vehicle (UCAV) task. The interface manipulation was the presence or absence of range rings around

the icons denoting UCAV positions on the Tactical Situation Display (TSD). Measures of effectiveness based on mission outcomes supported that the range rings were effective in aiding the operators. The integrated performance measures that evaluated route control effectiveness and weapons usage on a moment-by-moment basis throughout the mission were more sensitive to the interface manipulation the mission outcome measures. This supports the use of integrated performance measures in a test and evaluation setting. However, more importantly, because the integrated performance measure could be constructed in real-time, it offers a viable approach to producing a useful data stream that could be used by adaptive aiding systems.

User-Computer Interaction

Overview
Twenty-three people representing 18 organizations attended the subTAG. The agenda covered an introduction by the chair (LT Jim Patrey), a discussion of the evolving role of the subTAGs in supporting the DoD through DDRE, and three presentations.

Presentation Summaries
The UCI subTAG presentations focused on operator control of remote systems through a computer interface and computer facilitation of group decision making. User-computer interfaces for remote systems presents the challenge of maximizing functionality while minimizing extraneous information. The Predator UAV deviates from traditional aircraft control systems in a variety of ways that have not customarily been addressed in interface design and doctrine as cognitive overload can be manifest in subtle, unique ways. Similarly, control of tactical Tomahawk missiles also breaks new ground in UCI as it is unclear how to design interfaces for operators required to control dozens of semi-autonomous ordnance systems. Each of these raises new questions on how to design interfaces for these unique control systems.

In addition to increases in human control of remote systems via user-computer interfaces, there is also an increase in human-to-human remote, computer-mediated communication. The prevalence of these remote human interactions can produce inferior decision-making and is of great concern in today's distributed missions and network centric warfare. The development of UCI tools that mitigate and facilitate distributed group decision-making is essential for mission effectiveness.

1) Evolving role of subTAGs discussed; UCI name and charter remain unchanged.
2) No election was conducted; LT Patrey remains chair.
3) No open actions.

Presentations
- Development of a Human-Computer Interface for the Tactical Tomahawk - Missy Cummings, Ph.D. candidate, Systems Engineering, University of Virginia, Assistant Professor, Engineering Fundamentals Division, Virginia Tech.

The Tomahawk missile is the Navy's premier land attack missile, and indeed, the U.S. military has declared, "Because of its long range, lethality, and extreme accuracy, *Tomahawk*® has become the weapon of choice for the U.S. Department of Defense (U.S. Navy, 2000)." Both the Gulf War and the recent strikes in Afghanistan have demonstrated the precision and strategic value of the missile. However, one of the primary drawbacks to the missile is its "fire and forget" capability. The Tomahawk contains its own internal guidance and navigation system, and once it is launched, it cannot be redirected in-flight. In response to this shortcoming for what is otherwise a very effective weapon system, the U.S. Navy is in the process of designing a version, called the Tactical Tomahawk, which will have the capability of redirection in-flight. The implementation of the Tactical Tomahawk means that not only will battlefield commanders have more flexibility and options; it also means that a layer of human control will be needed where none previously existed. Introducing the ability to control a very fast-moving tactical weapon in the close-in combat arena and require an operator to manage high value assets through constant replanning requires substantial cognitive contribution, which will without a doubt significantly impact the effectiveness of future Tomahawk engagements. This presentation will

discuss the efforts of a University of Virginia research team in developing a human computer interface for the Tactical Tomahawk, as well as testing and future implications of this research.

- The Impact of Dynamic Flight Plans on Uninhabited Aerial Vehicle Piloting Performance - C1C Justin Godfrey, B.S. candidate, Department of Behavioral Sciences and Leadership United States Air Force Academy

Unmanned aerial vehicles (UAVs) are a relatively new addition to the U.S. military. The advantages of UAVs include the ability to remain airborne for extended periods. However, this often results in Predator pilots taking control of an already airborne UAV and highly adaptable, dynamic flight plans. This study examined the impact of pre-briefed versus dynamic flight plans for UAV operators on mission performance. Two groups of subjects with prior flying experience were evaluated on their flight performance; the control group flew simulator scenarios with pre-briefed mission objectives; the experimental group had mission objectives briefed in-flight. Flight performance was measured by deviation from scenario altitudes, headings, and airspeeds. UAV operators who were briefed mission objectives in-flight had significantly lower flight performance than operators who were pre-briefed mission objectives. The implications of these findings are that mission objectives may not be accomplished as efficiently or with as much quality by UAV operators who are presented with dynamic flight plans and that this should be addressed in developing UAV operational doctrine.

- Information Exchange in Group Decision Making: Review and Impact on Command and Control Systems - Dr. Robert Fleming, SPAWAR Systems Center-San Diego, Code 24402

The prevailing opinion is that group decision-making produces better quality decisions than that obtained from a single individual. This is usually attributed to the fact each participant has both shared information (SI), i.e. information already known to the other participants, as well as unique information (UI), i.e. decision-relevant information items known only to that participant. The pooling of SI and UI produces a larger number of available information items for the overall final decision process, and consequently a better quality decision. An extensive review of the research literature on the exchange and use of UI is presented and shows that (1) people in a group decision making environment are quite poor at sharing their UI, preferring to focus the discussion on the mutually held SI items and (2) even when UI items are brought up for discussion and review, they are usually discounted or ignored and are not factored into the final decision process. The vast majority of this research was conducted in a face-to-face group decision meeting environment, and the deficiencies in UI exchange/integration are attributed to social influences, e.g. group dynamics, self perception, peer pressure, member status, etc. Although the same UI deficiencies can be found in military command and control decision making, that environment is much more asynchronous, with group members distributed in both location and time. Since their major information exchange systems are email, message traffic, phones and VTC, vice face-to-face interaction, social influences become minimized and the primary difficulty in the exchange and use of UI revolves around the cognitive burden it places on both the sender and receiver of the UI. An information processing methodology is proposed to reduce this cognitive burden and is referred to as START (Structure, Tag, And Release Templates). The sequential process involves initial structuring of the decision task into specific evaluation criteria, tagging each relevant incoming information item with amplifying parameters such as relevance, timeliness, etc., and establishing a suite of manual, semiautomatic and automatic search/browse technologies for releasing/sharing the UI with group members. The template component refers to the pivotal concept that a simplified user interface, e.g. “point and click”, must be present to minimize any new cognitive demand imposed on the user. Prototype user interface designs and experimental test formats are presented.

Human Factors in Training Interest Group

This group did not meet at TAG-48.

Air Force Caucus

Dr. Kristen Liggett convened the Air Force caucus with seven members attending. There were two new members present. The theme provided by Dawn Woods for TAG 49 in Augusta, GA was discussed and potential speakers from the Air Force were identified. In addition, TAG 50 was discussed in some detail as it will be Air Force-hosted and will take place in Mesa, AZ (or other close location such as Tempe, Scottsdale, or Phoenix depending on what Sheryl can find) in November 2003. Lt Col Darrell Criswell suggested a theme on DoD accident rates and inviting Harry Robertson of Tempe to the plenary session to talk on Crash Survival.

One of our new members, Adrian Salinas of the 311th HSW/XRPA, Brooks Air Force Base, volunteered to be the next chair for the Test and Evaluation sub-TAG. We are still looking for an Air Force member to be the next chair for the Tools and Techniques sub-TAG. There was a reminder that one of the sub-TAG chair's duties is to provide a report on their session to Sheryl in a timely manner for inclusion in the TAG meeting minutes. In addition, since presentation abstracts will now be published on the web, it is the sub-TAG chair's duty to inform presenters of this to ensure that the abstracts are cleared for public release.

Much of the subsequent discussion centered on the TAG's ability and desire to be an advisory group to our proponent, Dr. Robert Foster of DDR&E. In the Executive Committee Meeting, Chair Sean Biggerstaff advocated a more aggressive role in responding to Dr. Foster's requests, and after this topic was addressed and accepted by the Operating Board, he agreed to work on a process to accomplish this goal. Currently, out biggest role as an advisory group is to review the Joint Warfighting Capability Objectives (JWCOs) Warrior Readiness chapter for technical accuracy and completeness. This, along with the four challenges Dr. Foster put forth at TAG 47 (a "Best Practices" guideline for C4ISR, HFE lessons learned database, documentation/quantification of HFE impact, HFE core competencies and a directory of expertise) will be the focus of our work between now and the next TAG.

Army Caucus

Army Caucus reviewed action items from the Executive Board including: date and location of TAG 49; minutes from the TAG meetings to be published electronically (save for a short list of VIPs who will continue to receive hard copies); status of the taskers from Dr. Foster (Army members were strongly encouraged to support any requests originating from these taskers):

Relevance as Advisory Group
C4ISR - there is a working group, please consider joining it
JWCO - Please respond promptly, this is a chance to influence future req's
Success stories - please submit, but also need to be quantifiable

TAG 49 was discussed in detail. Agreed that theme would relate to Transformation with emphasis on the domains of C4ISR, honing in on communication since TAG 49 is at the home of the US Army Signal Center and School. Detailed description to be prepared and provided to the Operating Board.

In closing the Army rep announced that the Army would need to name a Chair Select (for the TAG) in May, and for all Army members to consider the position, or nominees.

Navy Caucus

Discussion Points

- The importance of properly informing Dr. Foster of the TAG's performance and relevance was pointed out. Many of the following points during the meeting either addressed or were directly related to this topic.
- The TAG's relevance to Aviation Human Factors was discussed. Among the organization's means of presenting its relevance, the following categories were addressed:
    - The TAG provides technical advice to policy-making institutions on Human-Systems Interaction (HSI).
    - Production of TAG recommendations is accomplished through *taskers* delegated to SubTAGs that produce:
        - Comments on Joint Warrior documents.
        - Creating/improving C_4ISR website/database to include:
            - SME database.
            - POC's/labs in technical areas.
- It was mentioned that there is a high turnover rate in SubTAG chairmanships. It was suggested to the group that Navy representatives volunteer for vacant seats.
- Upcoming TAG meetings are scheduled to be held in:
    - Augusta, GA (to be hosted by the Army).
    - Phoenix/Scottsdale (to be hosted by the Air Force).
    - New Jersey (to be hosted by the FAA).

  The caucus was asked to think about where the next Navy-hosted TAG should be held. This meeting will follow the New Jersey TAG meeting.
- SubTAG Chairs should be well versed in the work that is being done by each member of their committees. This will make communicating the TAG's work to people such as Dr. Foster a more efficient and effective process.
- It was pointed out during the meeting that in the realm of DDR&E, each service is responsible for informing itself.
    - JWCO is the reference for HSI issues. Gaps between current status and DTO's can be identified, in part, by using this reference.
    - Changes in the JWICO will not affect Title 2.
- Operating structures will be changed so that the TAG can respond to inquiries from people such as Dr. Foster.
- It was pointed out that it has been difficult to persuade organizations to fund the TAG.
    - This difficulty may be allayed by indicating to funding organizations of the benefits of having a TAG:
        - (Joint) Networking opportunity for members.
        - Potential to provide timely, effective guidance in HSI issues.
    - Perhaps the TAG could be funded to conduct:
        - Article/report producing studies.
        - Document producing workshops.
- Production of web-based TAG material was readdressed. The points were reinforced that the web-based information should contain access to POC's and lab web pages. Among other things, this resource should evolve into a C4ISR lessons learned database. It was added that any funding that made its way to the TAG could be used to produce this resource.

- It was mentioned that the JWCO cycle should be brought into consideration by taskers and TAG working groups.
- NAVSEA 03 was an organization that was singled out as a possible source of funding for the TAG.
- Coordination of TAG plenary speakers should be undertaken by working group chairs.
- NAVSEA might be able to help the TAG by providing information on manning issues.

The Navy Caucus meeting concluded at 1800.

TAG Operating Structure

GOALS

- Provide a mechanism for exchange of technical information in the development and application of human factors engineering.
- Enhance working-level coordination among Government agencies involved in HFE technology research, development, and application.
- Identify human factors engineering technical issues and technology gaps.
- Encourage and sponsor in-depth technical interaction, including subTAGs as required in selected topical areas.
- Assist as required in the preparation and coordination of triservice documents such as Technology Coordinating Papers and Topical Reviews.

SCOPE

Because of the diversity of subject matter covered by the HFE discipline, the scope of technical areas addressed by the Technical Advisory Group (TAG) is necessarily broad. In general, HFE, as defined for purposes of TAG operation, deals with concepts, data, methodologies, and procedures which are relevant to the development, operation, and maintenance of hardware and software systems. Subject matter subsumes all technologies aimed at understanding and defining the capabilities of human operators and maintainers and insuring the integration of the human component into the total system to enhance systems effectiveness. Technologies directed toward improved manpower utilization through selection, classification, and training are included as appropriate.

TOPICAL AREAS

The TAG will address research and technologies designed to impact man-machine system development and operation throughout the complete system life-cycle. The general topics of concern to the TAG include, but are not limited to:

a. Procedures for use by HFE specialists, system analysts, and design engineers involved in the provision of HFE support during system development or modification.

b. Methodologies oriented toward the identification and solution of operator/maintainer problems related to equipment design, operation, and cost/effectiveness.

c. Mechanisms for application of developed HFE technologies, including formal and informal approaches to validation and implementation, and the determination of time windows for application.

GROUP COMPOSITION

The TAG will consist of technical representatives from Government agencies with research and development responsibility in the topical areas specified above. Additional representatives from activities with allied interests may affiliate with the TAG as appropriate. Attendance at specific meetings may be augmented by technical experts in special topical areas.

OPERATING BOARD

The TAG Operating Board is responsible for the conduct of TAG business and the implementation of TAG policies. The Board consists of an Executive Committee and the chairpersons of all subTAGs and committees. Operating Board meetings are called at the discretion of the TAG Chair.

The Executive Committee will be responsible for providing required continuity and acting for the full TAG between regular meetings. Regular members of the Executive Committee will be:

- Current Chair
- Immediate Past Chair
- Chair Select
- Army Representative
- Navy Representative
- Air Force Representative
- NASA Representative
- FAA Representative

CONDUCT OF BUSINESS

Meetings of the TAG will be held semi-annually, in the spring and the fall. Chairing of the group will rotate annually among the Army, Navy, and the Air Force. The Chair Select will be chosen by a caucus of the service whose turn it is to chair the DoD HFE TAG. Advice and counsel will be provided by the Operating Board. The Service Representatives will be selected by service caucus at the spring meetings in even-numbered calendar years. Advice and counsel will be provided by the Operating Board. Minutes of each meeting will be compiled by the Chair. Minutes will be distributed to all plenary session participants, to appropriate OSD offices, and to other agreed-upon agencies. Minutes shall serve as the principal mechanism for the reporting of group activity. A file of Minutes and relevant correspondence shall be maintained by each Chair. This file shall be passed to the succeeding Chair together with any additions to the file.

TAG SubTAGs

The DoD HFE TAG is composed of two categories of associated groups: SubTAGs and Committees. SubTAGs will be sponsored by the TAG as appropriate to respond to needs for detailed interchange and coordination in specific technical areas. SubTAGs will address problems of a general or continuing nature within a specific field of technology and are to develop their own working charters and operating procedures. SubTAGs may be disestablished upon recommendation by the Executive Committee. Committees will serve at the pleasure of the Operating Board and will address specifically defined tasks or problems. These committees will be disestablished on completion of those tasks or upon recommendation by the Executive Committee. Reports from each subTAG and committee will be published separately and included as a regular item of business on each TAG meeting agenda. Current subTAGs and committees are identified in the TAG Operating Board.

AMENDMENTS

Amendments may be recommended by submitting the suggested change(s) in writing to the TAG Chair. The Operating Structure may be amended by a majority vote of those attending the Operating Board meeting at which recommended amendments are voted upon.

1. Name change from Department of Defense Human Factors Engineering Technical Advisory Group to Department of Defense Human Factors Engineering Technical Group by request of OUSD approved on 19 November, 1987.

2. Amended 14 November, 1989 at TG-23, Killeen, Texas.

3. Amended 3 May 1994 at TG-32, Oklahoma City, Oklahoma.

4. Name change from DoD HFE TG back to DoD HFE TAG on 3 May 1994.

5. Name change from subgroup on 8 May 1996.

TAG Policies

1. Membership (General membership policies are outlined in the Operating Structure, under "Group Composition.")

1.1 Individuals who are not affiliated with Government agencies (but who are associated with technical societies or industrial associations with a stated interest in human factors engineering) wishing to affiliate with the TAG may contact the current Technical Society/Industry subTAG Chair to ascertain eligibility under the TAG Operating Structure. Once eligibility has been ascertained, the individual should submit a letter on the organization's letterhead, confirming his/her status as the organization's representative, to the current Chair of the Technical Society/Industry subTAG.

1.2 Emeritus Membership may be approved by the Executive Committee on a case-by-case basis for a former TAG member who is retired from government service or defense industry. Emeritus Membership is automatically deactivated during any period or re-employment with the government or defense industry.

2. Meeting Sites (Sites are recommended by the service caucus whose turn it is to host the TAG with a view toward a balance in geographic location and meeting facilities.)

2.1 TAG members are encouraged to recommend potential meeting sites.

2.2 Organizations who wish to host the TAG should contact their Service Representative or the current TAG Chair.

3. Agenda (The agenda is determined approximately three months before the scheduled meeting. The Chair Select selects the topics from those recommended by the Service Representatives, hosting agency and the TAG Coordinator.)

3.1 TAG members are encouraged to suggest potential agenda topics or topics suitable for tutorial sessions to their Service Representative, the current TAG Chair, or the TAG Coordinator.

4. Registration (Registration fees and the date of the close of registration are announced in an information letter sent approximately two months before the scheduled meeting.)

4.1 All attendees are expected to pre-register and prepay by the announced close of registration.

4.2 Only individuals receiving late travel approvals may register on-site. Payments made at the meeting site must be in cash.

5. Minutes (The Minutes of each meeting serve as the principal mechanism for the reporting of TAG activities. The Minutes will be published as a draft document on the website.)

5.1 Individuals or agencies desiring to be included on the distribution list for a specific meeting should contact the TAG Coordinator.

6. SubTAGs and Committees (See the Operating Structure, section entitled "TAG SubTAGs," for specific information regarding the purposes and operating procedures of subTAGs and committees.)

6.1 All subTAGs and committees are encouraged to meet in conjunction with the TAG at least once each calendar year.

6.2 All subTAGs and committees meeting in conjunction with the TAG are required to provide a chairperson for the specific meeting.

6.3 All subTAG and committee chairpersons are to submit a brief report of each meeting to be included in the set of TAG Minutes covering the subTAG/committee meeting time frame.

6.4 All subTAGs and committees are required to provide the TAG Coordinator with an up-to-date list of their membership for use in the distribution of TAG announcements.

6.5 All subTAGs are required to submit to the Executive Committee a Charter including, but not limited to, statements regarding:

- objectives
- membership policies
- meeting schedule
- scope
- chair selection/tenure

6.6 Committees are required to submit to the Executive Committee a document including, but not limited to, brief statements regarding:

- objectives
- membership policies
- chair selection/tenure

6.7 Rotation of the chair position is determined by subTAG charter. If the position cannot be filled by the appropriate service at the election meeting, the subTAG may progress to the next service willing to chair the subTAG

7. SubTAG Establishment

7.1 Groups interested in addressing technical areas not covered by existing subTAGs may request the TAG Chair to provide meeting time.

7.2 Formal subTAGs and committees may be established by recommendation of the Executive Committee.

8. Chair/Representative Selection (General selection procedures are outlined in the Operating Structure under "Conduct of Business.")

8.1 A Service caucus may be called by the TAG Chair or the current Service Representative.

8.2 Methods of determining the Chair Select and Service Representatives are Service dependent.

8.3 Unexpired terms of office will be filled by appointment by the Executive Committee, until a caucus of the Service can be called at the next regularly scheduled TAG meeting.

9. Funding The funding required for the organization, conduct, franking, and documentation of all TAG meetings shall be done jointly by the three Services and the Federal Aviation Administration and the National Aeronautics and Space Administration. The specific mechanisms to obtain and allocate funding from the Services/agencies shall be determined by the Executive Committee.

10. Policy Changes

10.1 Additions to or amendments of the above policies may be recommended by submitting the suggested change(s) in writing to the TAG Chair.

10.2 Policies may be amended by a majority vote of those Operating Board members in attendance at the Operating Board meeting at which amendments have been proposed.

Amended 14 November 1989 at TG-23, Killeen, Texas.

Amended 3 May 1994 at TAG-32, Oklahoma City, Oklahoma.

Amended 8 May 1996 at TAG-36, Houston, Texas.

Amended 7 November 2002 at TAG-48, Alexandria, Virginia.

Meeting Location Summary

MTG	DATE	LOCATION	CHAIR	HOST
1	9 - 10 Aug 1977	Ft. Washington, PA	LCDR Norman Lane	Naval Air Development Center
2	24 - 24 Jan 1978	Alexandria, VA	LCDR Norman Lane	Army Research Institute
3	22 - 24 Aug 1978	Dayton, OH	Lt Col Joseph Birt	Human Engineering Division, Wright-Patterson AFB
4	6 - 8 March 1979	San Antonio, TX	Lt Col Joseph Birt	Aerospace Medical Division, Brooks AFB
5	4 - 6 Dec 1979	Sunnyvale, CA	Dr. Edgar Johnson	NASA Ames Research Center Moffett Field
6	17 - 20 Nov 1980	New Orleans, LA	Dr. Edgar Johnson	Naval Biodynamics Lab, Michoud Station
7	18 - 21 May 1981	Monterey, CA	CDR Norman Lane	Naval Postgraduate School
8	12 - 14 Jan 1982	Orlando, FL	CDR Norman Lane	Naval Training Equipment Center
9	27 - 29 July 1982	Colorado Springs, CO	Dr. Richard Schiffler	US Air Force Academy
10	8 - 10 May1983	El Paso, TX	Dr. Richard Schiffler	US Army Research Institute, Ft. Bliss
11	4 - 6 Oct 1983	Atlantic City, NJ	Mr. Clarence Fry	FAA Tech Center
12	15 - 17 May 1984	Oxnard, CA	Mr. Clarence Fry	Pacific Missile Test Center, Point Mugu
13	6 - 8 Nov 1984	West Point, NY	Mr. Paul Linton	US Military Academy
14	7 - 9 May 1985	San Antonio, TX	Mr. Paul Linton	USAF Aerospace Medical Div/Brooks AFB
15	5 - 7 Nov 1985	San Diego, CA	Mr. Cyrus Crites	Navy Personnel Research and Development Center
16	6 – 8 May 1986	Cocoa Beach, FL	Dr. Michael Strub	NASA - Kennedy Space Center
17	18 - 20 Nov 1986	Monterey, CA	Dr. Michael Strub	Army Research Institute/Presidio of Monterey Field Unit
18	11 - 14 May 1987	Boston, MA	Dr. Michael Strub	Electronic Systems Division/Hanscom Field AFB
19	16 - 19 Nov 1987	Oxnard, CA	Dr. John O'Hare	Pacific Missile Test Center, Point Mugu
20	9 - 12 May 1988	Baltimore, MD	Dr. John O'Hare	US Army Human Engineering Lab, Aberdeen Proving Ground
21	31 Oct - 3 Nov 1988	Albuquerque, NM	Lt Col Thomas McCloy	USAF Operational Test and Evaluation Center, Kirtland AFB
22	15 18 May 1989	Orlando, FL	Lt Col Thomas	Navy Personnel Research

MTG	DATE	LOCATION	CHAIR	HOST
			McCloy	and Development Center
23	13 - 16 Nov 1989	Killeen, TX	LTC Gerald Krueger	Darnell Army Hospital, Ft. Hood
24	7 – 10 May 1990	Ft. Walton Beach, FL	LTC Gerald Krueger	US Air Force Munitions Systems Division, Eglin Air Force Base
25	12 - 15 Nov 1990	San Diego, CA	CDR Thomas Mitchell	Naval Health Research Center
26	13 - 16 May 1991	Natick, MA	CDR Thomas Mitchell	US Army Research Institute of Environmental Medicine
27	4 - 7 Nov 1991	San Antonio, TX	Dr. Stephen Rokicki	USAF Armstrong Lab, Brooks AFB
28	21 - 24 April 1992	New Orleans, LA	Dr. Stephen Rokicki	Naval Biodynamics Lab, Michoud Station
29	3 - 6 Nov 1992	Huntsville, AL	Mr. Richard Armstrong	US Army Research Lab, HRED MICOM Field Element
30	11 - 14 May 1993	Dayton, OH	Mr. Richard Armstrong	Human Engineering Division/Crew System Directorate, Armstrong Lab
31	15 - 18 Nov 1993	San Diego, CA	Dr. Carl Englund	Naval Health Research Center and Naval Command Control and Ocean Surveillance Center RDT&E Division
32	2 - 5 May 1994	Oklahoma City, OK	Dr. Carl Englund	FAA Civil Aeromedical Institute
33	31 Oct - 3 Nov 1994	Orlando, FL	Dr. Joe McDaniel	Army Research Lab Field Element and Army Research Institute
34	1 - 4 May 1995	Colorado Springs, CO	Dr. Joe McDaniel	USAF Academy
35	6 - 9 Nov 1995	Monterey, CA	Dr. James C. Geddie	Naval Postgraduate School
36	6 - 9 May 1996	Houston, TX	Dr. James C. Geddie	NASA - Johnson Space Center
37	4 - 7 Nov 1996	Baltimore, MD	Dr. Robert Smillie	US Army Research Laboratory, Human Research Engineering Directorate
38	5 - 8 May 1997	San Antonio, TX	Dr. Robert Smillie	Armstrong Laboratory, Brooks AFB
39	3 - 6 Nov 1997	Kissimmee, FL	Dr. Grant McMillan	Naval Air Warfare Center – Training Systems Division
40	11 - 14 May 1998	Alexandria, VA	Dr. Grant McMillan	Federal Aviation

MTG	DATE	LOCATION	CHAIR	HOST
				Administration
41	16 – 19 Nov 1998	Waltham, MA	Mr. Richard Armstrong	US Army Soldier and Biological Chemical Command, Natick
42	10 – 13 May 1999	Alexandria, VA	Mr. Richard Armstrong	N/A
43	1 – 4 Nov 1999	Albuquerque, NM	LCDR Russell Shilling	Air Force Operational Test and Evaluation Center and the Safety Center, Kirtland AFB
44	1 – 4 May 2000	Arlington, VA	LCDR Russell Shilling	Office of Naval Research
45	6 - 9 Nov 2000	El Paso, TX	MAJ Scott Smith	ARL-HRED Ft. Bliss Field Element
46	14 – 17 May 2001	Colorado Springs, CO	MAJ Scott Smith	Air Force Space Command, Peterson AFB
47	29 April – 2 May 2002	San Diego, CA	Dr. James C. Geddie	Space and Naval Warfare Systems Center
48	4 - 7 Nov 2002	Alexandria, VA	LCDR Sean Biggerstaff	N/A

Meeting Attendees

Director
U.S. Army Research Lab/HRED
Attn: AMSRL-HR-MB (J. Lockett)
Aberdeen Proving Ground, MD 21005-5425
(410) 278-5875 DSN 298; FAX (410) 278-5032
jlockett@arl.army.mil

Ms. Lisa Achille
NAVAIR
21544 Breton View Court
Leonardtown, MD 20650
(301) 342-9706 DSN 342; FAX (301) 342-9305
achillelb@navair.navy.mil

CPT Gina Adam, PhD
US Army Aeromedical Research Lab
P.O. Box 620577
Ft. Rucker, AL 36362
(334) 255-6806 DSN 558; FAX (334) 255-6993
gina.adam@se.amedd.army.mil

Dr. Laurel Allender
ARL-HRED
AMSRL-HR-MB
Aberdeen Proving Ground, MD 21014
(410) 278-6233 DSN 298; FAX (410) 278-5032
lallende@arl.mil

Ms. Teresa K. Alley
DISA MATRIS Office, DTIC
NAS North Island Box 357011, Bldg 1482
San Diego, CA 92135-7011
(619) 545-7384 DSN 735; FAX (619) 545-0019
talley@dticam.dtic.mil

Jeff Alton
48110 Shaw Road, Unit 5
Bldg 2187, Suite 2280
Patuxent River, MD 20670
(301) 342-8458 DSN 342; FAX (301) 342-9305
altonjd@navair.navy.mil

Maj Terence Andre
AFRL/HEA
6030 S. Kent St.
Mesa, AZ 85212-6061
(480) 988-6561x142 DSN 474; FAX (480) 988-6285
terence.andre@williams.af.mil

Ms. Susan G. Archer, SCS Rep.
Micro Analysis & Design Inc.
4900 Pearl East Circle, Suite 201 E
Boulder, CO 80301
(303) 442-6947 FAX: (303) 448-1913
sarcher@maad.com

Mr. Richard Armstrong
P.O. Box 310728
Enterprise, AL 36331-0728
(334) 347-3600
dickmar@ala.net

LT Rick Arnold
NOMI, Code 341
340 Hulse Road
Pensacola, FL 32508
(850) 452-2257x1090 DSN 922; FAX (850) 452-2144
rdarnold@nomi.med.navy.mil

Ms. Laura Bajor
AMTEC Corp
3102 N. Calvert St. #2
Baltimore, MD 21218
(443) 255-0339 (410) 662-7589
lbajor@amtec-corp.com

Dr. Thomas Balkin
Walter Reed Army Institute of Research, Rm #2A26
503 Robert Grant Ave.
Washington, DC 20307-5100
(301) 319-9350 DSN 285; FAX (301) 319-9979
thomas.balkin@na.amedd.army.mil

Ms. Margaret Beecher-Deighan
NSWCDD/AEPCO
10637 High Beam Court
Columbia, MD 21044
(410) 964-5106
beecher@aepco.com

LCDR Sean Biggerstaff, MSC, PhD
PMA 205-1D, Aviation Training Systems
Naval Air Systems Command, 547123 Buse Road
Patuxent River, MD 20670-1547
(301) 757-8135 FAX (301) 757-6945
BiggerstaffS@navair.navy.mil

Mr. Clete Booher
7235 McKeever
Pearland, TX 77584
(281) 489-8375 (281) 483-1847
creidboo@hotmail.com

William J. Bramble Jr.
NTSB, AS-50
490 L'Enfant Plaza SW
Washington, DC 20594
(202) 314-6354 FAX (202) 314-6369
bramblw@ntsb.gov

Malcolm Brenner
NTSB, AS-50
490 L'Enfant Plaza SW
Washington, DC 20594
(202) 314-6351 FAX (202) 314-6369\
brennem@ntsb.gov

Mr. Bryan Brett
SAIC
4031 Colonel Glen Highway
Dayton, OH 45431
(937) 431-4390 FAX (937) 431-2288
bryan.e.brett@saic.com

Mr. Derek Brock
NRL, Code 5513
4555 Overlook Ave. SW
Washington, DC 20375
(202) 767-0491
brock@itd.nrl.navy.mil

Evan Byrne
NTSB, AS-50
490 L'Enfant Plaza SW
Washington, DC 20594
(202) 314-6352 FAX (202) 314-6369
byrnee@ntsb.gov

Ms. Regan Campbell
NAVAIR
21457 Cameron Court
Lexington Park, MD 20653
(301) 342-9250 FAX (301) 342-9305
campbellrh@navair.navy.mil

LT Walter Carr
NHRC
PO Box 85122
San Diego, CA 92186-5122
(619) 553-0479 DSN 553; FAX (619) 553-8551
(619) 553-8551
carr@nhrc.navy.mil

Dr. Tony B. Carvalhais
USCG, G-WKS-3, Rm 5308
2100 2nd St. SW
Washington, DC 20593
(202) 267-2244 FAX (202) 267-4355
acarvalhais@comdt.uscg.mil

Ms. Faith Chandler
NASA Headquarters
300 E. Street, SW
Washington, DC 20546
(202) 358-0411 FAX (202) 358-2778
fchandle@hq.nasa.gov

Melanie Chang
Naval Surface Warfare Center
9500 MacArthur Blvd.
Bethesda, MD 20817-500
changmi@nswccd.navy.mil

Mr. Brad Collie
US Navy Coastal Systems Station, Code E31
6703 West Highway
Panama City, FL 32407-7001
(850) 234-4744 FAX (850) 235-5152
colliebe@ncsc.navy.mil

Ms. Sheryl Cosing
TAG Coordinator
10822 Crippen Vale Ct.
Reston, VA 20194
(703) 925-9791 FAX (703) 925-9694
sherylcosing@earthlink.net

Capt Eric Cox
2601 Louis Bauer Drive
Brooks AFB, TX 78235-5130
(210) 536-5267 DSN 240; FAX (210) 536-2335
eric.cox@brooks.af.mil

LtCol Darrell Criswell
HQ AFOTEC/TSH
8500 Gibson Ave., SE
Kirtland AFB, NM 87117-5558
(505) 846-1357 DSN 246; FAX (505) 846-1357
darrell.criswell@afotec.af.mil

LT Courtney L. Crooks
4710 Prieto Dr. #506
Pensacola, FL 32506
(850) 458-6209 FAX (850) 452-2144
courtneylcrooks@yahoo.com

Missy Cummings
111 Observatory
Charlottesville, VA 22903
(434) 293-0729
mlc3u@virginia.edu

Thomas R. Curran
DOT/FAA/ATL-FSDO-11, Campus Bldg.
1701 Columbia Avenue, Sute 2-110
College Park, GA 30337-2748
(404) 305-7249 FAX (404) 305-7337
thomas.curran@faa.gov

Ms. Nancy Dolan
2442 Sagewood Ct.
Waldorf, MD 20601
(703) 614-5781 FAX (703) 697-8684
n125b@bupers.navy.mil

LtCol Brian Donnelly
AFRL/HEC
2255 H Street
Wright-Patterson AFB, OH 45433-7022
(937) 255-7573 DSN 785; FAX (937) 255-8752
brian.donnelly@wpafb.af.mil

Ms. Marilyn Dudley-Rowley
OPS-Alaska c/o Soc Dept Sonomo State Univ.
1801 E. Cotati Ave.
Rohnert Park, CA 95928
(707) 730-1037
MD_R@hotmail.com

Dr. Linda R. Elliott
Veridian Engineering
Bldg 170, Suite 203, Brooks City-Base
San Antonio, TX 78235
(210) 534-1134 x12
linda.elliott@brooks.af.mil

Phillip Fatolitis
51 Hovey Road
Pensacola, FL 32526
(850) 452-3287x1173 DSN 922; FAX (850) 452-9328
pfatolitis@namrl.navy.mil

Dr. Robert Fleming
SSC-SD
Code 22402
San Diego, CA 92152
(619) 553-3628 DSN 553; (619) 553-9391
rfleming@spawar.navy.mil

Dr. M.R. Fletcher
20 Pleasant Street
Ashland, MA 01721
(508) 233-4356 DSN 256;
fletcherm@natick.army.mil

LT Sidney Fooshee
NAVAIR Orlando Training Systems Division
12350 Research Parkway
Orlando, FL 32826-3224
(407) 380-4258 DSN 960; FAX (407) 380-4793
Sidney.Fooshee@navy.mil

Mr. Terrell W. Fulbright
JXT Applications, Inc.
1122 Brewster Drive
Beavercreek, OH 45434
(937) 427-0974 FAX (937) 0974
twfulbright@jxtai.com

Dr. James C. Geddie
2002 Antelope Trail
Harker Heights, TX 76548-2164
(254) 698-6405
geddie.hsiac@usa.com

Mr. Benjamin Gibson
AMEDDC&S
14723 Oak Briar
San Antonio, TX 78232-4679
(210) 221-1622 DSN 471; FAX (210) 221-0121
ben.gibson@amedd.army.mil

Cadet Justin Godfrey
P.O. Box 1758
USAFA, CO 80841-1758
(719) 333-1758
c03justin.godfrey@usafa.af.mil

Ms Kerrie Gruber, M.Ed.
3601 Wilson Blvd
Arlington, VA 22201
(703) 797-3384
kgruber@sainc.com

Ms. Nancy Grugle
Virginia Tech
1303 Ascot Lane
Blacksburg, VA 24060
(540) 951-1519
ngrugle@vt.edu

Dr. Chris Hale
SAIC
4031 Colonel Glen Highway
Dayton, OH 45431
(937) 431-4376 FAX (937) 431-4488
christopher.r.hale@saic.com

Dr. Kathleen Hannifin
Learning & Performance Support Lab
University of GA
Athens, GA 30602
(706) 542-3157 (706) 542-4321
khannafi@coe.uga.edu

LT Chris Hart, MSC, USNR
48110 Shaw Rd., Unit 5
Bldg 2187, Suite 2280
Patuxent River, MD 20670-1906
(301) 342-9254 DSN 342; FAX (301) 342-9308
hartcl@navair.navy.mil

Mr. Keith Hendy
DRDC Toronto, PO Box 2000
1133 Sheppard Avenue West
Toronto, Ontario Canada M3M 3B9
(416) 635-2074 FAX (416) 635-2104
Keith.Hendy@drdc-rddc.gc.ca

Dagny Johnson
WRAIR, Div of Neuropsychiatry
503 Robert Grant Ave.
Silver Spring, MD 20910
(301) 319-9065
dagny.johnson@na.amedd.army.mil

Judith A. Johnston, Ed. D
Human Systems IAC, c/o Booz Allen Hamilton
3190 Fairview Park Drive, #890
Falls Church, VA 22042
(703) 289-5712 FAX (703) 289-5801
johnston_judith@bah.com

Ms. Pat Kilduff
US Army Research Lab, HRED
ATTN: AMSRL-HR-S(Kilduff)
Aberdeen Proving Ground, MD 21005-5425
(410) 278-5874 DSN 298; FAX (410) 278-5940
pkilduff@arl.mil

Mr. John D. Kimball
Naval Surface Warfare Center - Dahlgren Division
17320 Dahlgren Rd., Code G53
Dahlgren, VA 22448
(540) 653-0783 FAX (540) 653-2508
kimballJD@nswc.navy.mil

Dr. Christopher Kolanko
MD Biotech, Inc.
511 Burroughs Street
Morgantown, WV 26505
(304) 598-1101 FAX (304) 598-1183
chriskolanko@mdbiotechinc.com

Dr. Kristen Liggett
AFRL/HECI
2210 Eighth Street
Wright-Patterson AFB, OH 45433-7511
(937) 255-8251 DSN 785; FAX (937) 656-4547
kristen.liggett@wpafb.af.mil

Maj Robert Lindberg
311 HSW/XPRA
2510 Kennedy Circle
Brooks AFB, TX 78235-5115
(210) 536-4457 DSN 240; FAX (210) 536-4475
robert.lindberg@brooks.af.mil

LT Loukia Loukopoulos, PhD, MSC
NASA-Ames Research Center
HF Res & Tech. Div, MS 262-4
Moffett Field, CA 94043
(650) 604-2843 (650) 604-3323
llouko@mail.arc.nasa.gov

Mr. William Lytle
AsHF/AsMA Lockheed Martin Astronautics
PO Box 179
Denver, CO 80201-0179
(303) 971-8972 FAX (303) 971-3174
william.b.lytle@lmco.com

Dr. Robert McCann
NASA-Ames Research Center
Attn: MS 262-4
Moffett Field, CA 94035-1000
(650) 604-0052 FAX (650) 604-3323
rmccann@mail.arc.nasa.gov

Dr. Thomas McCloy
FAA; AAR-100, Rm. 907
800 Independence Ave., S. W.
Washington, DC 20591
(202) 267-7167 FAX (202) 267-5797
tom.mccloy@faa.gov

Dr. Joe W. McDaniel
AFRL/HECI
2210 8th St, Bldg 146
Wright-Patterson AFB, OH 45433-7511
(937) 255-2558 DSN 785; FAX (937) 656-4547
joe.mcdaniel@wpafb.af.mil

Ms. Jennifer McKneely
11100 Johns Hopkins Rd
Laurel, MD 20723
(240) 228-7476 FAX (240) 228-6667
jennifer.mckneely@jhuapl.edu

Dr. Grant McMillan
AFRL/HECP, Bldg. 33
2255 H St
Wright-Patterson AFB, OH 45433-7022
(937) 255-8750 DSN 785; FAX (937) 255-8752
grant.mcmillan@wpafb.af.mil

Major Joe Menchaca, Jr.
AFRL/CCN
2275 D Street, Rm 155
Wright-Patterson AFB, OH 45433-7217
(937) 656-9085 DSN 986; FAX (937) 656-5368
jose.menchaca@wpafb.af.mil

Mr. Stephen C. Merriman
The Boeing Co.c/o Raytheon MS 269
P.O. Box 660246
Dallas, TX 75266-0246
(972) 344-7578 FAX (972) 664-0092
stephen.c.merriman@boeing.com,scmerriman@attbi.com

Mr. Thomas Metzler
Booz Allen/HSIAC
Bldg. 196, 2261 Monahan Way
Wright-Patterson AFB, OH 45433-7022
(937) 255-6623 DSN 785; FAX (937) 255-4823
thomas.metzler@wpafb.af.mil

Dr. Thomas M. Mitchell
CHI Systems, Inc.
2 John Dyer Way
Doylestown, PA 18901
(407) 277-4288 FAX (407) 277-0625
tmitchell@chiinc.com

Dr. Lance Molnar
MD Biotech, Inc.
511 Burroughs Street
Morgantown, WV 26505
(304) 598-1101 FAX (304) 598-1183
lancemolnar@mdbiotech.com

Dr. Jennifer Narkevicius
ARINC, Inc.
44423 Airport Rd, Suite 300
California, MD 20619
(301) 863-2300 FAX (301) 863-2331
narkeviciujm@navair.navy.mil

Dr. Thomas Nesthus
FAA CAMI, AAM-510
P.O. Box 25082
Oklahoma City, OK 73125
(405) 954-6297 FAX (405) 954-4852
tom.nesthus@faa.gov

Mr. Fred Oberman
Naval Surface Warfare Center, Code 24
9500 MacArthur Blvd.
West Bethesda, MD 20817-5700
(301) 227-0033 FAX (301) 227-0051
ObermanFR@nswccd.navy.mil

LT Jim Patrey
HQ USAFA/DFBL
2354 Fairchild Drive
USAF Academy, CO 80840-6228
(719) 333-9891 DSN 333; Fax: 719-333-6711
Jim.Patrey@usafa.af.mil

Mr. Jake Pearson
Micro Analysis and Design, Inc.
4949 Pearl E. Circle, #300
Boulder, CO 80301
(303) 442-6947 FAX (303) 442-8274
jpearson@maad.com

1Lt Jim Peoples
Air Force Research Laboratory
3007 SE Military Apt 4104
San Antonio, TX 78223
(210) 632-0866 DSN 240; FAX (210) 632-2761
james.people@brooks.af.mil

LT Henry Phillips
Naval Aerospace Medical Institute
340 Hulse Road
Pensacola, FL 32508
(850) 452-2257x1091 FAX (850) 452-2144
hlphillips@nomi.med.navy.mil

Mr. Eric Pierce
6703 W. Highway 98, Code E31
Panama City, FL 32407
(850) 235-5595 DSN 436
PierceEC@ncsc.navy.mil

Ms. Beth Plott
Micro Analysis and Design, Inc.
4949 Pearl E. Circle, #300
Boulder, CO 80301
(303) 442-6947 FAX (303) 442-8274
bplott@maad.com

Mr. Alan Poston
Federal Aviation Administration, AND-202
800 Independence Ave. SW, Rm 339
Washington, DC 20591
(202) 493-4519
alan.poston@faa.gov

Ms. Colby Raley
Strategic Analysis/DARPA
3601 Wilson Boulevard, Suite 500
Arlington, VA 22201
(571) 218-4310 FAX (703) 741-0220
craley@snap.org

Dr. Garrison Rapmund
6 Burning Tree Ct.
Bethesda, MD 20817
(301) 365-1419 FAX (301) 365-3187

Ms. Jill Ritter
AFRL/HESR
367 Birdsong Dr.
Vandalia, OH 45377
(937) 255-4250 FAX (937) 255-4250
jill.ritter@wpafb.af.mil

Mr. Adrian Salinas
311 HSW/XPRA
2510 Kennedy Circle, Suite 116
Brooks AFB, TX 78235
(210) 536-4428 DSN 240; FAX (210) 536-4475
adrian.salinas@brooks.af.mil

Dr. James Sampson
22 Robin Hill Road
Holliston, MA 01746
(508) 233-4698 DSN 256; FAX (508) 233-6472
james.sampson@natick.army.mil

LCDR Dylan Schmorrow
DARPA/ITO
3701 North Fairfax Drive
Arlington, VA 22203-1714
(703) 696-0360 DSN 754;
dschmorrow@darpa.mil

Lt Jennifer Smith
Air Force - Brooks
5239 Eisenhauer Rd., Apt. 1113
San Antonio, TX 78218
(210) 650-8110
jennifer.smith@brooks.af.mil

Roy Stripling, PhD
Stategic Analysis, Inc.
One VA Square, 3601 Wilson Blvd. Suite 500
Arlington, VA 22201
(703) 797-4515 FAX (703) 527-5445
rstripling@sainc.com

Mrs. Jennifer C. Swoboda
US Army Research Lab, HRED
ATTN: AMSRL-HR-SE
Aberdeen Proving Ground, MD 21005
(410) 278-5948 DSN 298; FAX (410) 278-5940
jcrouch@arl.mil

Dr. David Thorne
Walter Reed Army Institute of Research
Div. Neuropsychiatry, 503 Grant Ave
Silver Spring, MD 20910-1500
(301) 319-9975 FAX (301) 319-9979
david.thorne@na.amedd.army.mil

Dr. Michael Tulloch
3 Sigma Research Inc.
13019 475th Ave.
Alcester, SD 57001
(605) 253-2355
mtulloch@tulloch.org

Mr. Steven Vanderwalker
NAVAIR, Bldg 2187, Suite 2280
48110 Shaw Road, Unit 5
Patuxent River, MD 20653
(301) 342-3773 FAX (301) 342-9305
vanderwalksj@navair.navy.mil

Ms. Nina Verma
48110 Shaw Rd.
Bldg 2187, Suite 2280-C6
Patuxent River, MD 20670
(301) 342-9286
verman@navair.navy.mil

Dr. Michael Vidulich
AFRL/HECP
2255 H St
Wright-Patterson AFB, OH 45433-7022
(937) 255-8734 DSN 785; FAX (937) 255-8752
michael.vidulich@he.wpafb.af.mil

Mr. Maris Vikmanis
AFRL/HEC, Bldg 248
2255 H St
Wright-Patterson AFB, OH 45433-7022
(937) 255-7580 DSN 785; FAX (937) 255-8752
maris.vikmanis@he.wpafb.af.mil

Dr. Norman W. Warner
Naval Air Warfare Center Aircraft Division
Crew Systems (4.6.4), Bldg 2187, Suite 2259
Patuxent River, MD 20670
(301) 342-9288 FAX (301) 342-9305
warnernw@navair.navy.mil

Dan Wheeler
3800 Perrin Central 534
San Antonio, TX 78217
(210) 637-6539 DSN 240
daniel.wheeler@brooks.af.mil

Mihriban Whitmore
NASA/JSC
2101 NASA Road One
Houston, TX 77058
(281) 244-1004 FAX (281) 483-3789
mwhitmor@ems.jsc.nasa.gov

Dr. Henry Williams
NAWC AD, Crew Systems
48110 Shaw Road
Patuxent River, MD 20670
(301) 342-9275 FAX (301) 342-9305
williamshp2@navair.navy.mil

Mr. John Winters
Basic Commerce & Industries, 16347 Dahlgren Rd
PO Box 1748
Dahlgren, VA 22448
(540) 663-3321x140 FAX (540) 663-3307
john_winters@teambci.com

Ms. Dawn Woods
AMSSB-RSS-E(N)
100 Kansas St.
Natick, MA 01760-5020
(508) 233-5069 DSN 256;FAX (508) 233-6472
dawn.woods@natick.army.mil

Ms. Marjorie Zelco
HQDA G-1, MANPRINT Directorate (DAPE-MR)
300 Army Pentagon
Washington, DC 20310
(703) 695-2146 DSN 225; FAX (703) 695-8411
marjorie.zelko@hqda.army.mil